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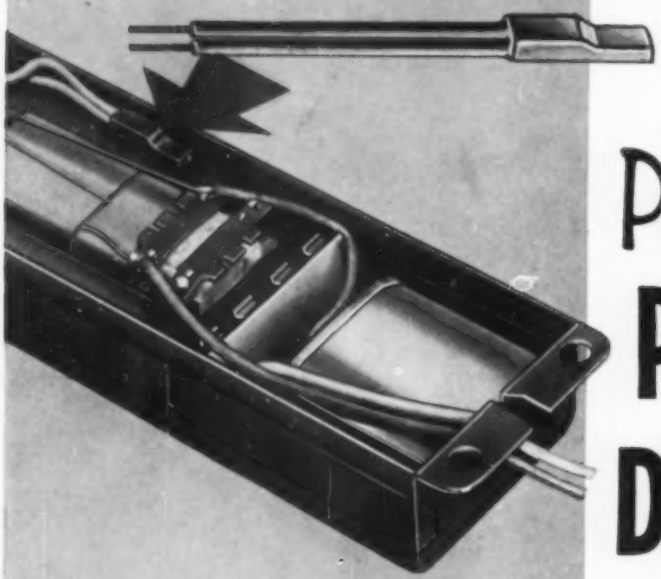

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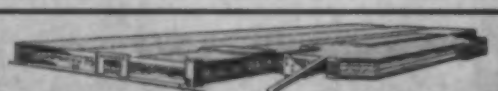

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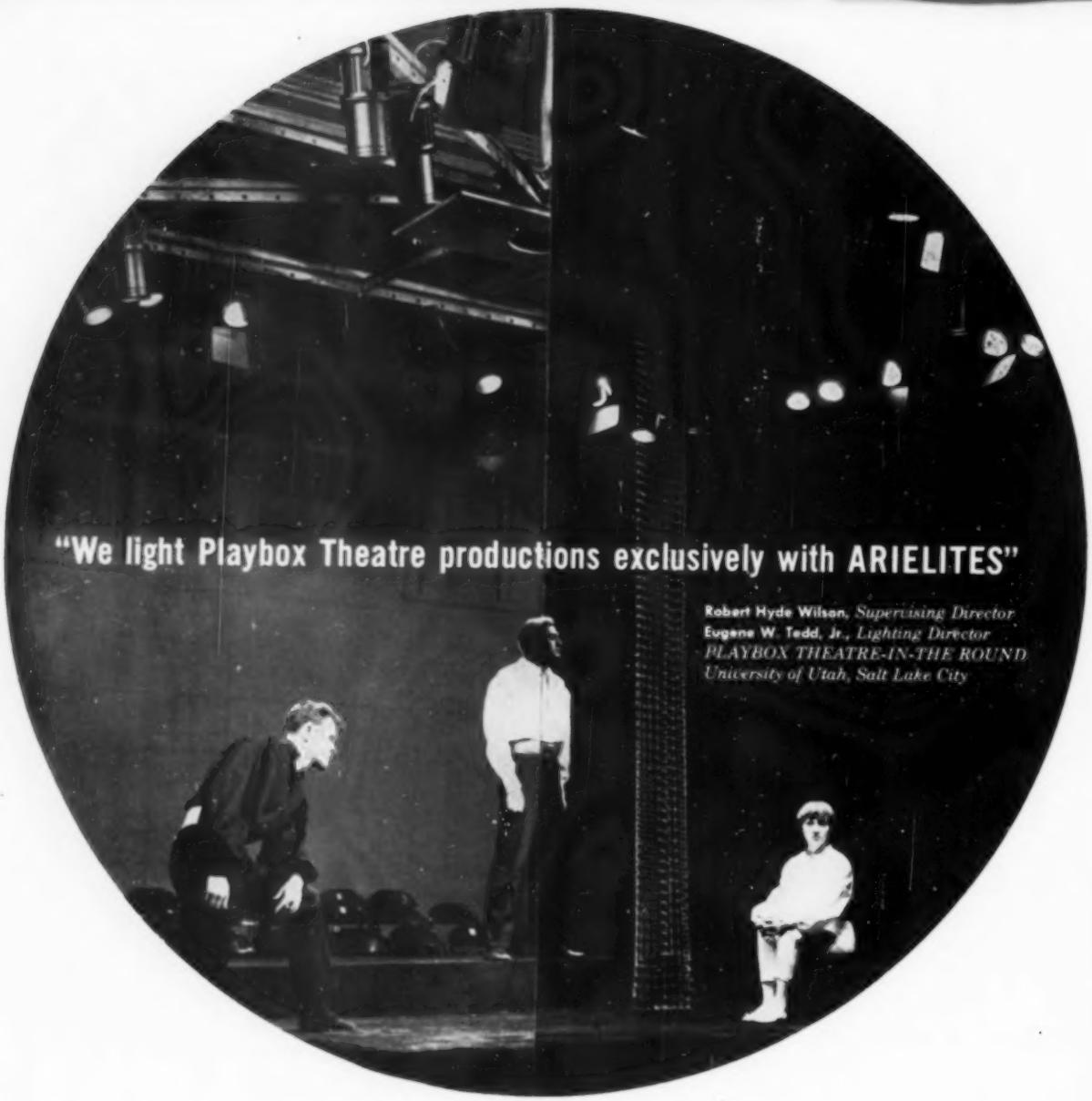
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THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

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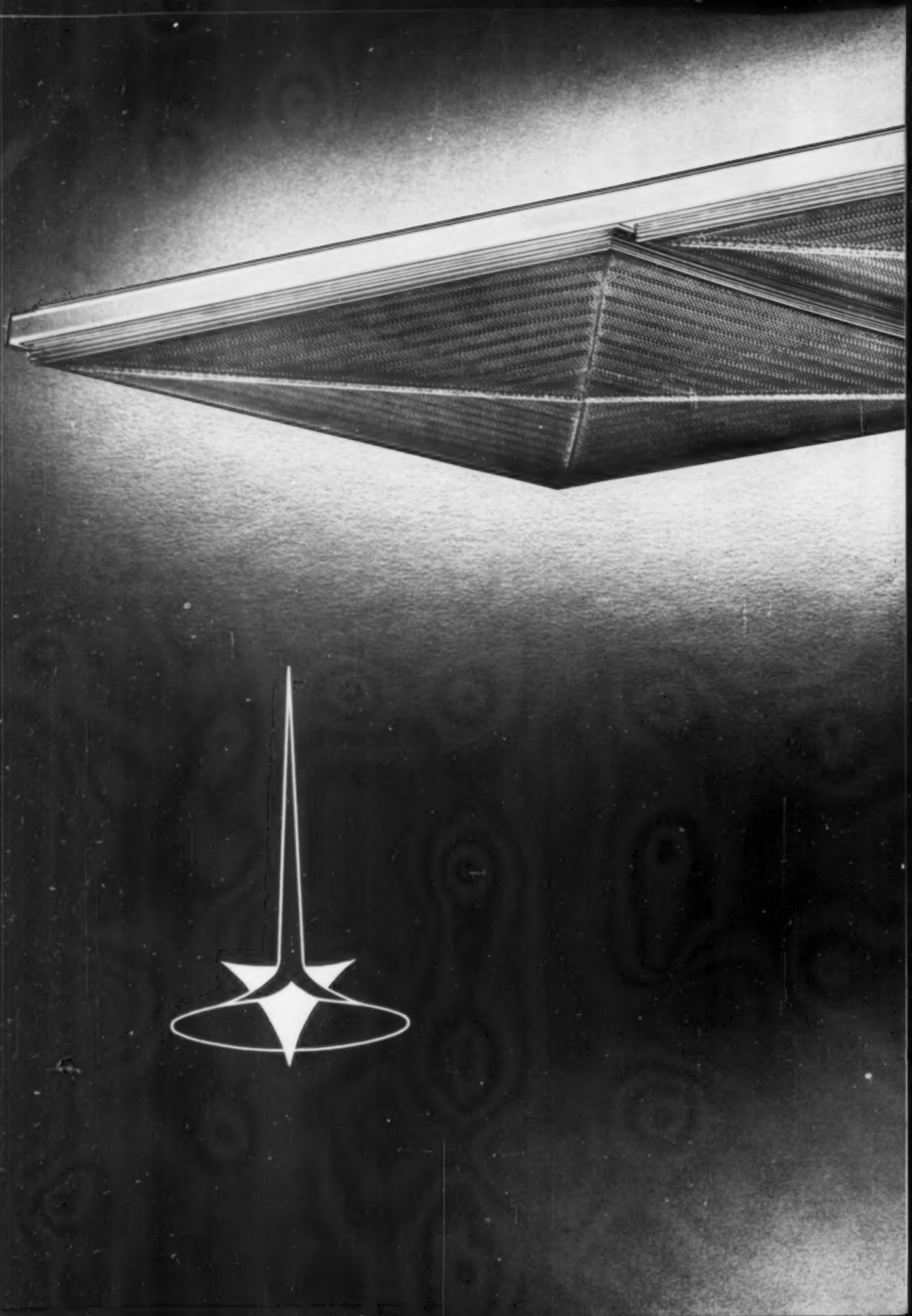

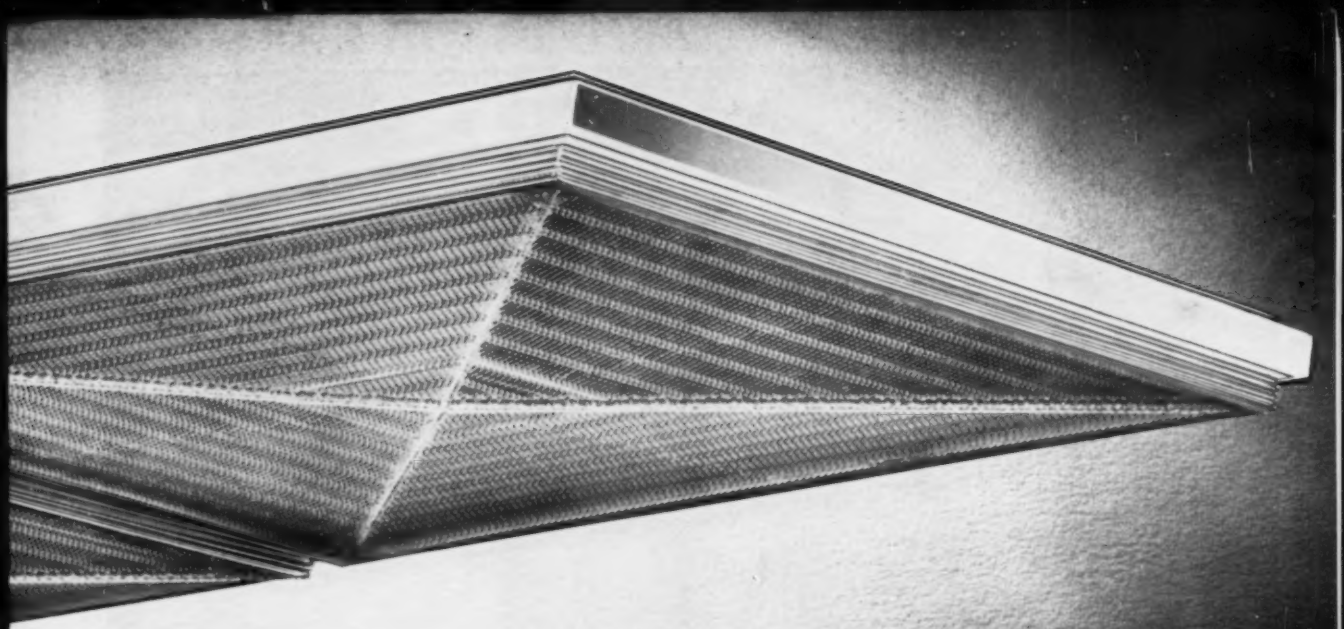

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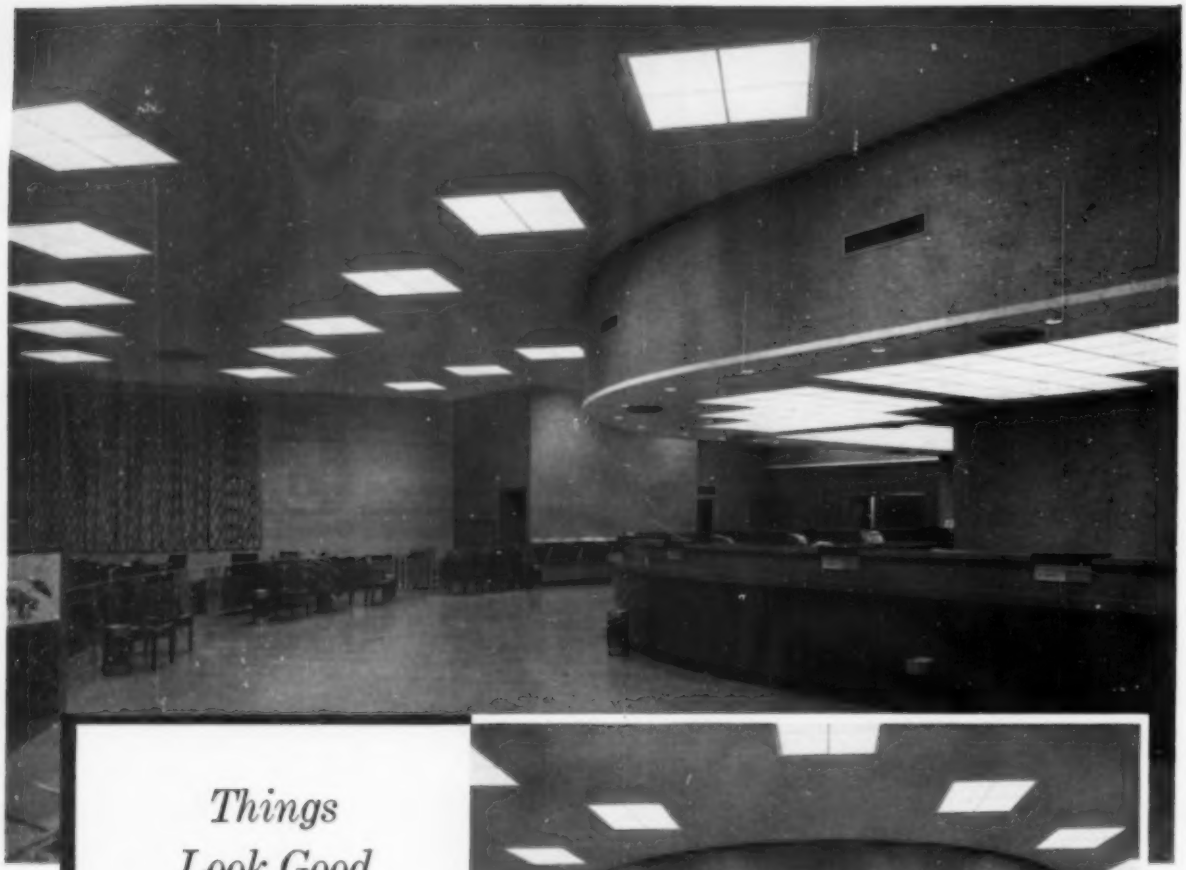
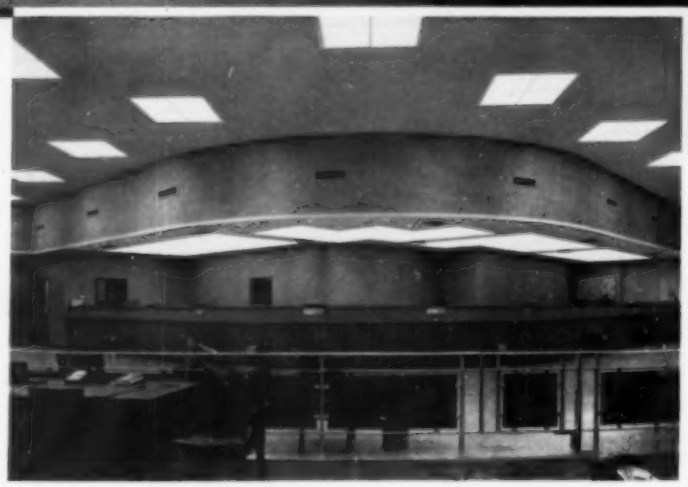


Things Look Good at the Nation's Second Oldest Bank



Here's another Litecontrol bank installation which features glamor without glare and function without frills. It's at the Slater Trust Office of the Industrial National Bank in Pawtucket, Rhode Island — a bank which traces its corporate ancestry to the Providence Bank, founded in 1791.

Fixtures are all equipped with Holophane acrylic lenses, and include a luminous lens ceiling plus 4′ x 4′ and 2′ x 4′ units. Note how the luminous lens ceiling panels are designed "round the corner" under the curved soffet, over the tellers' counters.

The 4′ x 4′ fixtures are spotted to adequately illuminate the irregular public area and officers' section. A specially designed long narrow lens fixture may be seen above the elevator in the major photo.

Think of Litecontrol for *your* next installation.

INSTALLATION: Slater Trust Office, Industrial National Bank, Pawtucket, Rhode Island.
ARCHITECT: Leonard S. Muir, Pawtucket, Rhode Island.
DESIGN ENGINEER: A. Thomson Cooksey, Pawtucket, Rhode Island.
ELECTRICAL CONTRACTOR: Crawford Electric Construction Company, Pawtucket, Rhode Island.
DISTRIBUTOR: Westinghouse Electric Supply Company, Providence, Rhode Island.
LITECONTROL DISTRICT SALES ENGINEER: Dallas G. Dearmin, 5 Hillcrest Ave., Greenville, Rhode Island.
AREA SHOWN: General Banking Area.
CEILING HEIGHTS: 15′-0″ and 10′-0″.
FIXTURES: Litecontrol Luminous Lens Ceiling panels, #4384RS-6025 8-lamp Rapid Start recessed 4′ x 4′ fixture, and #9344RS-6025. 4-lamp Rapid Start recessed 2′ x 4′ fixtures, all using Holophane acrylic lenses.
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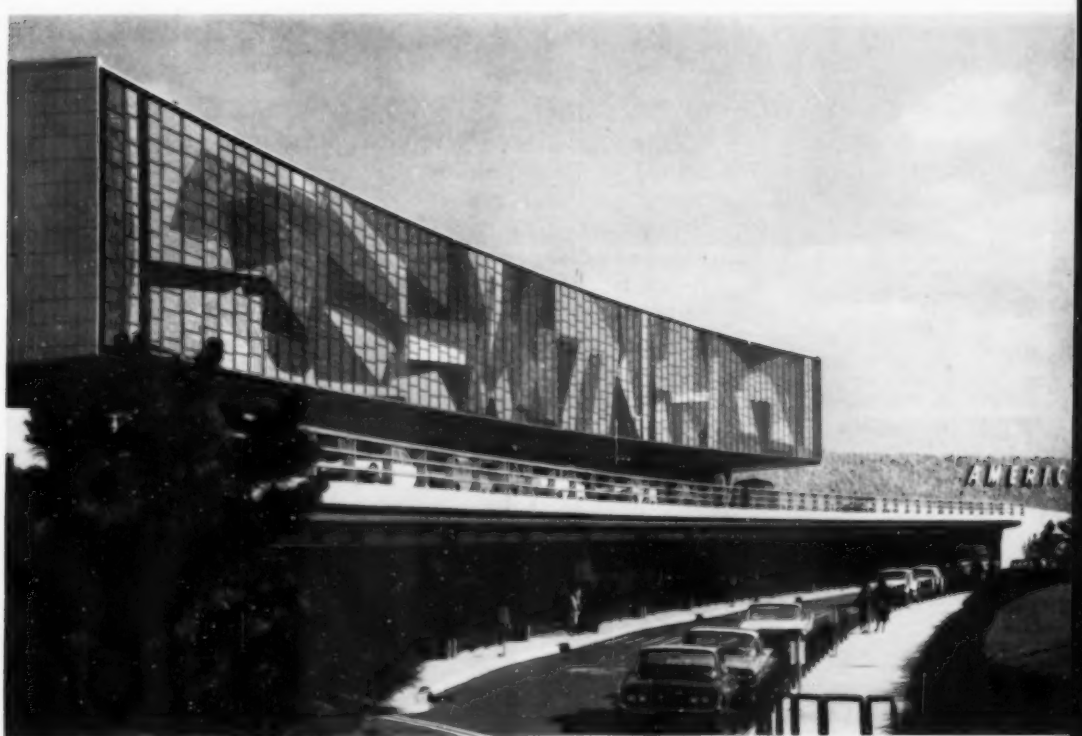
Upper Montclair, N.J.



AMERICAN AIRLINES TERMINAL

A Study in Architectural Lighting

An interesting shift in lighting dynamics has been underway for years. This is the acceptance, as a major goal in the design of installations, of an over-all lighting pattern, its relationship to its environment, and its contribution to the environment. So-called "architectural lighting" is no longer associated only with decorative lighting. The concept applies, for many current designs, for the most utilitarian of installations as well as creative esthetic plans.

Both phases of this concept—functional and esthetic—are exemplified in the lighting design judged "best" of 199 Class II entries in the Society's Applied Lighting Competition. The success of each is the result of close collaboration of engineer and architect.

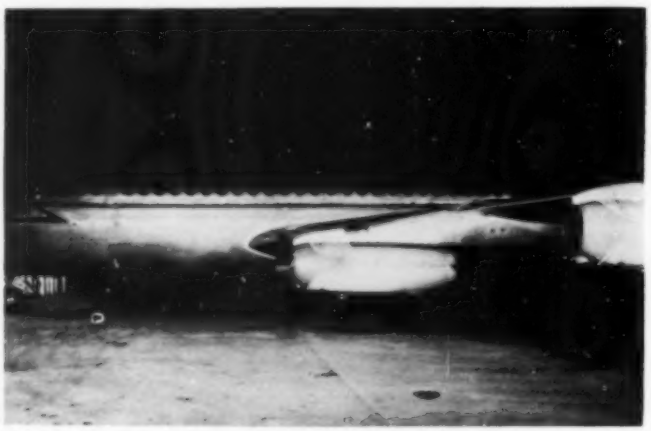
The problems involved in this entry were two of several unique developments concerned with the lighting for the American Airlines Terminal Building at New York International Airport. One, utlitarian and functional, was the illumination of the aircraft aprons or plane parking positions; the other, a spectacular, decorative mural glass window of huge proportions. A common denominator for both problems, however, was the appreciation by the engineer of the aims of his architectural associates.

Aircraft Aprons

Although this functional area of the airlines operation is not usually considered in the esthetics of its accompanying structure, nevertheless for this outstanding building there were a number of architectural requirements: (a) light sources in harmony with the motif of the structures; (b) lighting equipment compatible with attractive daytime appearance; (c) luminaires of flexible design to suit other apron needs; (d) mounting height of luminaires not to exceed 14 feet.

Lighting requirements included a high level of good quality illumination

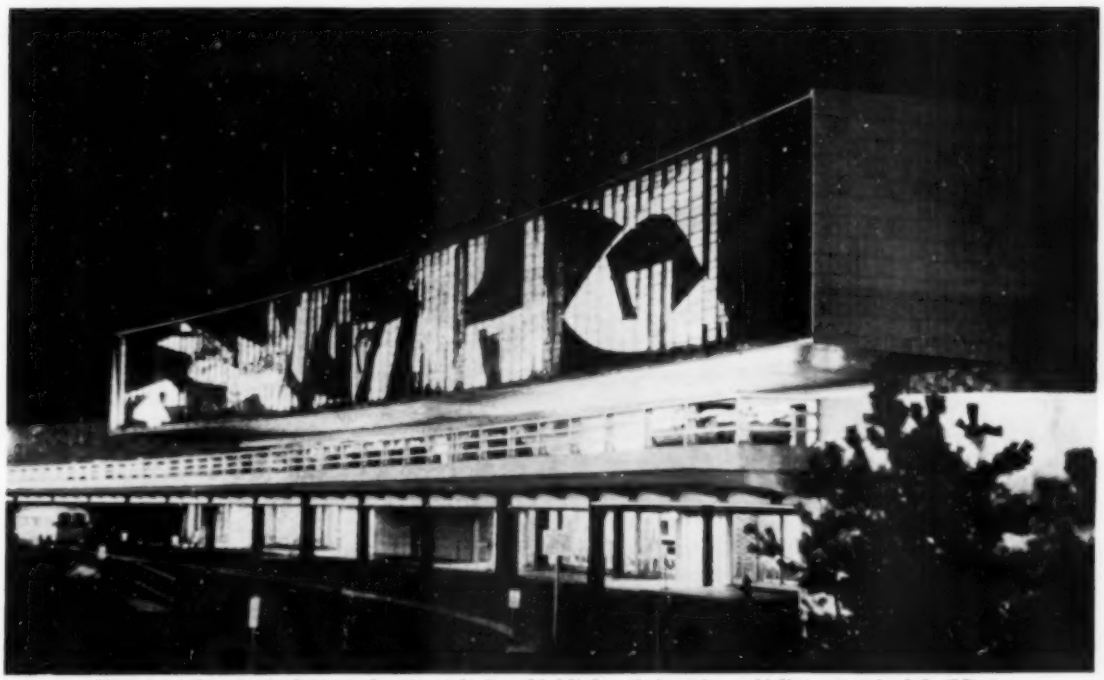
Inconspicuous apron lighting units blend into structural lines of terminal building.



Note sharp cutoff of light below pilot eye level to ensure absence of glare in pilot's field of view.

for a distance of 150 feet, no visible glare from luminaires at pilot eye level and elimination of deep shadows in areas of ground crew activity.

The accompanying photographs illustrate the success of this partnership of lighting and architectural requirements. All of the apron lighting criteria were met with a luminaire designed for medium brightness, high candlepower, and controlled light distribution with sharp cutoff, mounted in long continuous rows. Adjustable, specular reflectors mounted within rectangular enclosures were



Illuminated stained glass window is nighttime highlight of American Airlines terminal building.

designed to control light cutoff and vertical beam spread. To reduce atmospheric corrosion or deterioration of the reflector, a coating similar to that of the "Echo Balloon" was used. Exterior housings were anodized to match other exterior finishes, and because of their weatherproof construction could be either recessed within building walls or surface mounted.

Luminaires were installed in eight-, six- or four-foot lengths to suit specific runs or lines of fixtures. In certain sections, empty housings or filler pieces with clear acrylic plastic windows were inserted to give a uniform daytime appearance. Basic architectural criteria thus were upheld by the slim lines of inconspicuous luminaires, the absence of poles and clean-looking roof lines. There were no warts, protrusions or appendages.

Footcandle readings taken at the completion of the installation showed typical values of approximately seven footcandles at 100 feet and a *maximum* (not average) to minimum ratio of about two to one.

Since the mounting heights were approximately 14 feet, the light cutoff was adjusted to five degrees below horizontal. Thus, a pilot taxiing his Boeing "707" to within 10 feet of the building is always above cutoff and sees only an unfilled reflector brightness of some 200 footlamberts.

The problem of shadows was eliminated by the linear character of the light

Indirect lighting for stained glass window mural is provided by a continuous row of controlled fluorescent luminaires reflecting off a full length white drapery (visible at top of photo) placed four feet behind the window.

sources and the right-angle placement of the lines of light at each plane position. Thus, the requirements of high illumination levels, good quality and absence of glare toward the critical viewer (the pilot) were met.

Other apron requirements included the incorporation of illuminated clocks in the luminaire housings and "nose-in" lights to contrast with the light cast by the apron fixtures. For maximum visibility of "nose-in" target by day or night, a combination of lighting contrasts was employed—contrasting direction of linear source, contrasting color and relative brightness. The specific fixture developed for this function is a 24-inch fluorescent lamp mounted vertically within an aviation yellow, translucent enclosure.

Mural Glass Window

This is the world's largest stained glass window. It forms the entire upper half of the terminal building in a curving sweep of 320 feet, 22 feet high. To create uniform illumination for this beautiful exterior mural was the second phase of this architectural-lighting problem.

Requirements and limitations of this lighting design included: (a) no direct lighting through the window; (b) uniform brightness over the entire window; (c) two levels of illumination; (d) maximum of four feet available behind the window for luminaire mounting; (e) provisions for future changes in lighting level or color hues; and (f) ease of maintenance.

The solution to this problem again resulted in the adoption of linear light sources of rectangular beam spread with sharp cutoff and high candlepower.

A full length white drapery placed four feet behind the mural glass window provided the necessary reflector. Then a continuous row of controlled fluorescent luminaires was installed on the floor adjacent to the window and focused upon the drapery to produce uniform brightness for the full height of 22 feet. Because of the sharp cutoff embodied in the luminaire design, no direct lighting fell on the glass. Instead, all the light passing through the stained glass was produced by reflection from the illuminated drapery.

Since dimming equipment was not available for the 1500-ma fluorescent lamps used, two ballasts of different current ratings were installed in each luminaire. A two-to-one ratio of light output from the same lamp was thus effected. Since changes in lighting level are infrequent, switching of lamps to either ballast is controlled by a simple external manual throw-over at each fixture.

The result is true color rendition of the stained glass in either day or night. Should tinting be desired in the future, lamps of different colors may be substituted, or color filters placed over the luminaire windows. As higher output lamps become available, these too may be substituted.

Several interesting aspects of illuminating engineering are illustrated in this installation. To wit: The substitution of engineered, linear light sources for conventional point sources can often overcome the rapid fall-off of lighting level with increase of distance. In fact, the level can be made to increase with distance, within limits. A closer coupling of light source to area being illuminated is now practical without sacrificing uniformity of brightness or intensity. Because of more accurate control of light distribution, many glare problems now can be dissipated. Above all, this installation shows:

New lamps, new material and some "lightimagineering" can produce surprising results.

APPLIED
LIGHTING
COMPETITION

CLASS I

1st

LIVABLE LIGHTING

Philadelphia Section
East Central Region

ELIZABETH A. MEEHAN

Builder's Lighting Representative
Philadelphia Electric Company

What is this year's best lighted home wearing? From a sample of one, the top residential lighting installation in the 1961 Applied Lighting Competition, it would seem:

- Illumination levels which meet and exceed IES recommendations in all areas.
- Structural and other built-in equipment almost to the exclusion of portables.
- An edgelighted Plexiglas panel as a major decorative element.

Designed in the blueprint stage of the home, all lighting was planned to achieve maximum visual comfort based on IES recommended levels. So important was the lighting in the over-all interior design that it took priority over furnishings in budget allocations.

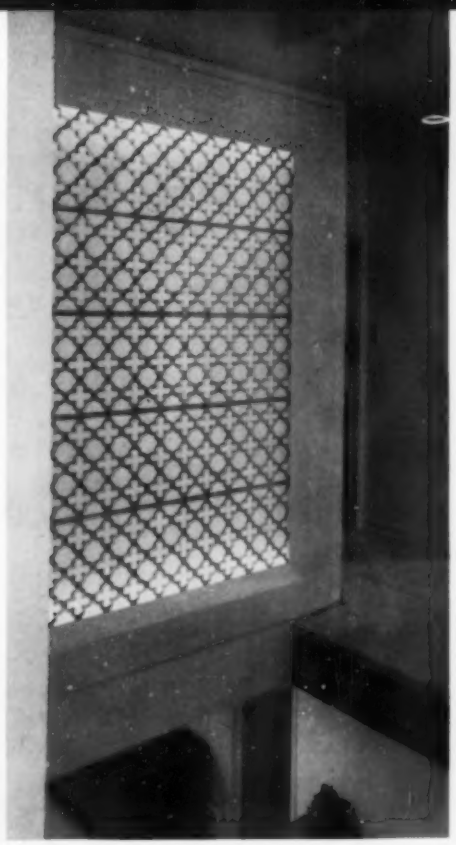
The emphasis on structural and other built-in lighting elements, although in part due to the owner's desire for "purity of line," is indicative of a growing trend in residential lighting. These techniques, long preferred to portable lamps for achieving diffuse general illumination and high levels for specific visual tasks, have become a major source of imaginative decorative effects too. Witness the edgelighted luminous panel on page 633.

The decorative simplicity of the entire lighting design blends with the mood established by the modern architecture and furnishings. Six downlights with 75-watt reflector lamps, recessed in an overhang, illuminate the facade and path to the door. In the entrance hall, decorated with two seed panels, four recessed 150-watt wall washing units reflect off a white wall for a diffuse lighting environment. Bedroom lighting includes a combination of wall washing units for general illumination, a valance over the bed and one of the two portables in the home. Other areas are shown on the next two pages.

Designed to create a "sheltered" intimate environment, living room lighting is characterized by the use of incandescent sources and absence of light on the ceiling. Sources of general illumination are 10 recessed 150-watt wall-washing units illuminating the modern patterned draperies, and two downlights directed at projecting plane of the fireplace. Four deep multi-grooved baffled downlights with 150-watt reflector lamps over the central seating area and a suspended bubble fixture with 100-watt lamp above the marble table add focal glow at conversation areas. Four separate dimming controls are used to obtain maximum flexibility of lighting effects. Change of pace from the over-all downlighting scheme is provided by a 60-watt lumiline lamp mounted behind hi-fi speaker near fireplace. Two louvered downlights with reflector lamps supply localized lighting over a built-in bar (not visible).

Dining room lighting serves as transition from low brightness and intimate atmosphere of living room to higher brightness in kitchen. Four 150-watt wall washing units illuminating the draperies repeat lighting theme of living room, and provide background of light for dining table. Because of higher reflectance of white draperies and smaller scale of this room, over-all effect is more open and luminous than that of living room. Suspended contemporary fixture equipped with four 40-watt incandescent lamps provides highlighting on dining table. Here, too, separate dimming controls for wall washing and decorative units permit variation of lighting moods.

(Facing page, bottom). Canopy overhang, 12 inches from ceiling, extending full length of 8½-foot vanity, is source of both general and local illumination in bathroom. Equipped with two rows of 40-watt warm white fluorescent lamps and shielded by low brightness, ⅜-inch circular plastic louvers, this unit provides 110 fc on vertical planes of face, 70 fc under chin and 95 fc general lighting—all far above IES minimum recommendations. Recessed vapor-proof unit is installed in shower.



In deliberate contrast to intimacy of living areas, windowless kitchen was lighted to create a feeling of daylight. The 10- by 15-foot gallery type kitchen, illuminated by two skylights during the day, has simulated skylights for after dark. Two rows of 20-watt fluorescent lamps in each skylight, shielded by Plexiglas diffusers duplicate daytime effect. Wall cabinets on both sides of room, furred out on two- by four-inch strips, act as shields for single rows of fluorescent lamps mounted at top and bottom edges of cabinets. Light from the lamps at top of cabinets reflected off white walls and ceiling raise general illumination level. Lamps at lower edge supply shadowless, high level (110 fc average) illumination on champagne colored work surfaces. General illumination in kitchen averages 55 fc with no brightness in normal field of view in excess of 9 to 1. In counterpoint to diffuse functional lighting is a decorative pendant for localized lighting over snack bar.

Not wall hangings, but an edgelighted Plexiglas panel (above right) is major decorative element in stairwell and bedroom hall. Moorish pattern in plywood was used as a template for painting Plexiglas, and the plywood panel, in red-orange set flush against the wall, off register from Plexiglas, to create a three-dimensional effect. Plexiglas and two F72T12 warm white lamps are centered 2¼ inches from back of four-inch deep plenum. Two strips of Plexiglas with 40-degree bevel laminated to panel allow more light to enter the sheet and provide a support for hanging. Wood frame is hinged for easy relamping. Although the cost of this installation is not slight, it is considerably less than that of a good painting or tapestry, and creates a unique, decorative effect. Auxiliary passage light in hallway is provided by two recessed downlights with regressed Fresnel lenses.

2nd

Creative Lobby Lighting

SECOND ONLY to over-all architectural effect in image value is the design of a building's lobby. With the recent construction boom in prestige commercial buildings has come a marked concern for lobby design and, particularly, lobby lighting. Designs vary from the simple use of downlights for the display of changing educational exhibits, through the gamut of dramatic luminous ceiling systems employing such techniques as grooved baffles, colored panels and saw-tooth construction.

As unique and imaginative as any lobby lighting installation published in IE within recent memory is the design

CLASS II

MELVIN COHEN

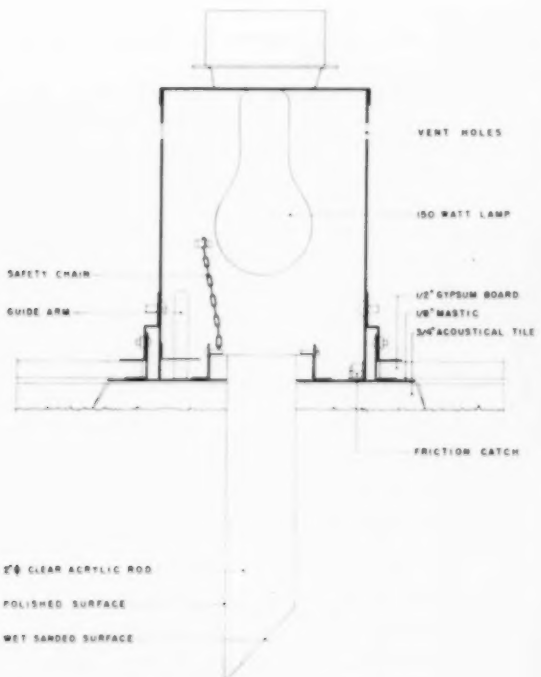
LEO CHICCA

Chicago Section, North Central Region

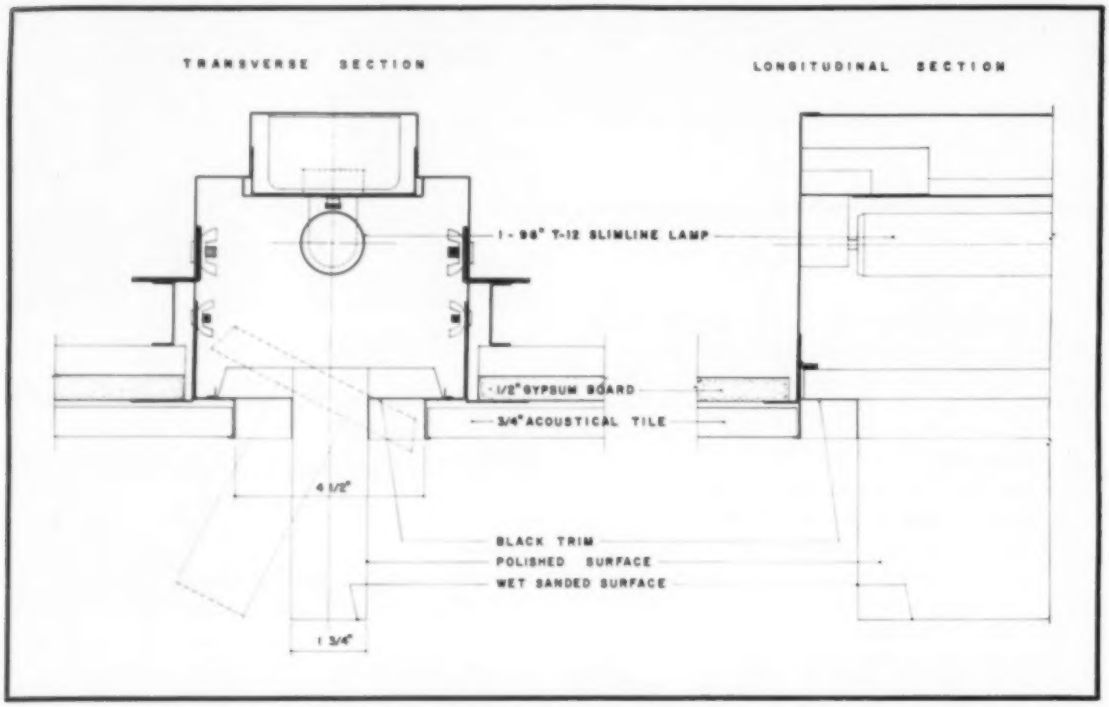
A. Epstein & Sons, Engineers-Artchitects
Chicago, Illinois

for the waiting area and reception gallery in the office of A. Epstein & Sons, Chicago architects. A subtle advertisement for the creativity of the firm's illumination staff, the design might be characterized as having captured the elusive quality of understated elegance.

The two-part design includes a 13- by 11-foot reception area and a 53- by 9-foot waiting area which also serves as a gallery for the display of renderings of work currently underway in the office. A random pattern of two-inch diameter acrylic rods, protruding from the ceiling beneath recessed incandescent fixtures, lights the reception center. The rods or stalactites, varying in length from six to twelve inches, have wet-sanded ends cut at a diagonal of 45 degrees to increase the surface area of the sanded portion. Incandescent light entering the rod at the top is emitted only at the sanded diagonal cut. The polished sides of the rods confine the rays of light without actually transmitting them—a property of clear acrylic material.



(above) Cross section view of stalactite fixture.
(right) View of gallery/waiting area looking toward reception desk. Note random pattern of stalactite fixtures over reception area in background.



Edgelighted troffer unit. Relamping is accomplished by tilting acrylic bars which rest on ceiling plate, as shown.

Acoustic tile cemented to the face plate of the fixture blends unnoticeably into the ceiling, creating the illusion that the stalactites are projecting down from the tile.

Each fixture is a standard high hat housing equipped with a 75-watt lamp rated at 130 volts and operated at 118 volts. The high voltage rating gives the lamps a life of 3500 hours which, since the units are on at all times, facilitates an economical maintenance schedule.

The edgelighting motif is repeated in the gallery waiting area with crosswise-mounted, eight-foot single-lamp troffers equipped with 1¾-inch thick acrylic bar diffusing elements. Each troffer contains a 96T12 slimline cool white lamp operated at 425 ma. Acrylic bars are arranged in an alternating pattern of two four-foot lengths or one four-foot and two two-foot lengths to form an interesting pattern when viewed crosswise to the gallery.

Subtle integration of the architectural and lighting designs is obtained from the relationship between the acrylic bars and the aluminum mullions separating the gallery from the exterior planting court. Both acrylic bars and mullions are 1¾-inches thick and mounted on four-foot centers. The crosswise mounting arrangement of the troffers also serves as a means for creating an illusion of width in the gallery.

As with the stalactites in the reception area, optical illusion is employed to create the sensation of a suspended bar of light. The horizontal members of the fixtures are covered with black epoxy resin and the ceiling tile arranged to overlap the fixture ceiling plate, which supports the T-shaped acrylic bars.

Illumination level from the edgelighted troffers averaged 18 fc after one year of service. Supplementary lighting for the paintings is provided by recessed assymetric incandescent units equipped with 150-watt PAR38 floods and regressed Fresnel lenses. Tilted at a 10-degree angle, these units provide 85 fc maintained on the renderings. The light bounced off the high reflectance draperies provides an additional 15 fc in the seating area, for an average combined level of 33 fc from incandescent and fluorescent units.

This beautiful lighting pattern, viewed through the glass exterior from a heavily travelled Chicago street, is perhaps one of the most effective examples of esthetic engineering.

BUILT-IN PLEASURE

To paraphrase a well-known phrase-maker—never can so much [enjoyment] be gained so surely by so many—as by well-designed residential lighting. Any advantage to the environment of esthetic application of lighting and interior design goes double in the home. Here the enjoyment is for itself and without distraction.

The young couple whose home is shown on this and the following two pages had the imagination to visualize what lighting could contribute to pleasant family living. From the scrapbook stage onward, lighting consultant, architect and interior designer (and a cooperative carpenter) collaborated with them toward these attractive and functional interiors.

Carefully planned built-in elements of both house and furnishings have been designed to incorporate lighting features, for either function, effect or both. This is a happy circumstance for a lighting consultant, happily implemented in this spacious home.

CLASS 1 **2nd**

Tennessee Valley Section
South Central Region

MAY LOVE GALE

Tennessee Valley Authority
Nashville, Tenn.

Simplicity of the furnishings and their monochromatic color scheme demanded special lighting considerations. Structural and recessed lighting employing colored fluorescent and incandescent lamps here produce the required esthetic qualities. The free-form ceiling pattern of the entry (foreground) is lighted by three 40-watt fluorescent lamps—blue, gold and pink—installed in a 10-inch cavity between the two ceilings. The blend of blue, gold and pink lamps spreads a subtle wash of color across the ceiling "cloud" and its shielding lip. Ten high-hat units housing blue-white, pink and gold PAR lamps are scattered across the ceiling of the living room (background) repeating the basic colors of the "cloud." These units serve planter, music areas and other furniture groupings. The valance-cove combination (background), which extends into the formal dining area, page 639, has 40-watt deluxe cool white fluorescent lamps.

Carefully designed built-in elements are a feature of the large informal family-living area which accommodates a variety of activities. Here the family portrait is important, and is highlighted. The center fixture of three suspended units is lamped with a 30-watt R-20 lamp and adjusted to spread light over the picture. Four recessed louvered high-hat units, each with 150-watt PAR lamps, deliver 38 footcandles at reading position of the occasional chairs and sofa. Floor and table lamps provide flexibility of mood for conversation. Cornice lighting washes two panelled walls. A structural lighting element (upper left corner) follows a corner window seat and provides 25 footcandles. This incorporates six 40-watt deluxe warm white lamps shielded by one- by six-inch baffles, which form exaggerated grating in the same finish as the panelling.

For the dining portion of this large family area, a suspended fixture, 30 inches in diameter, provides 35 footcandles for dining and/or table games. Fluorescent lamps concealed in the tops of cabinets give a generous wash of upward light, and over the magazine rack (left in the picture) and built-in desks, useful downward light as well. For both the children's desk and kitchen desk (at right) 55 footcandles are provided. The completely interior kitchen (background in the photograph) has general illumination of 48 footcandles. This is provided by a luminous ceiling equipped with rows of 40-watt fluorescent channels with deluxe warm lamps on 24-inch centers in an 18-inch cavity, shielded by 24-inch square formed plastic panels. At sink and all working areas, 75 to 125 footcandles are supplied by under-cabinet fluorescent units.

The combination cove-valance extending from formal living room (page 637) into the dining area is itself an interesting example of coordinated building and lighting design. Only where it crosses the draperies is the cove open at the bottom. At these points, the 40-watt deluxe cool fluorescent lamps (dimmer controlled) wash the draperies with light — providing a subtle effect of statement and understatement. The free-form "cloud" repeats the entry lighting motif. In this area, however, it incorporates a recessed unit with a 100-watt blue-white PAR lamp directly over the table, highlighting the center appointment.

A delightful area for dining, conversation and relaxation is this screened porch, roofed with milky-white rigid plastic. Above the plastic roof, seven adjustable hooded units are mounted on the overhang of the house proper. Three blue-white, two gold, and two pink 100-watt PAR lamps are adjusted so that the colors blend to create the appearance of twilight. Three recessed step lights identify the free-form steps leading from the carport to the family room and/or porch.

Structural lighting for beds and desks was a feature of all three bedrooms. Shown here is a typical treatment in the little girl's room. The built-in headboard incorporates a double-tilt wall bracket concealing 40- and 20-watt fluorescent lamps. Corrugated plastic is used across the opening, top and bottom. An upward wash of light complements the decorated wall, and 20 footcandles are delivered for casual reading in bed. Thirty-five footcandles are provided on the built-in desk by a shielded fluorescent lamp. White draperies reflect light into the room from a wall-to-wall lighted cornice (not visible in this view).

INSTALLATION AT DALE SHARP'S AUTO SUPERMARKET,
20TH ST. AND TOPEKA AVE., TOPEKA, KANS.

Lighting a Used Car Lot

LIGHTING OBJECTIVE: To provide the proper illumination for the nighttime merchandising of used automobiles.

GENERAL INFORMATION: The lot has a frontage of 300 feet and a depth of 150 feet. In general the cars are parked in three rows. Grade surfacing is asphalt with a "whitening agent" which increased the reflectance to 20 per cent.

INSTALLATION: General illumination is provided by 50 Revere catalog No. 7403 wide beam enclosed floodlights with Alzak aluminum specular finish reflectors, each equipped with one H18GW, 1000-watt improved-color mercury lamp. These 50 units are mounted in groups of ten on top of five 35-foot poles spaced on 50-foot centers at the property line along the 300-foot frontage. Catalog No. 217-ZA steel pipe brackets are used for pole mounting these floodlights. The mercury lamp ballasts are located at the base of each pole.

Clusters of ten Revere catalog No. 3510-AL aluminum lamp holders equipped with 200-watt PAR-16 narrow spot incandescent lamps are mounted 12 feet above grade on each of the five 35-foot poles. Illumination from these units adds sparkle and color to the grilles on the front line of automobiles.

After six months, operation footcandle readings averaged: 200 to 500 footcandles on the front line of cars; 150 on the second row of cars; and 40 footcandles on the rear row. It has been reported that the color rendering of the cars is quite satisfactory with the use of this improved-color mercury floodlighting system.

Lighting designed by Neil J. Thompson, Commercial Sales Supervisor, The Kansas Power and Light Co., Topeka, Kans.

Lighting data submitted by Neil J. Thompson as an illustration of good lighting practice and to aid in the design of similar installations.

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LARGE SCALE ELECTROLUMINESCENT PANEL LIGHTING SYSTEMS

By JOEL E. RUBIN and PHILIP F. DIETZ

In 1938 the widespread commercial introduction of fluorescent lamps opened entirely new vistas of lighting design to architects, interior designers, and lighting engineers. Through subsequent years the challenge and progress in the development and utilization of this linear light source has been recorded at the IES Conferences. Now, almost a quarter of a century later, the commercial introduction of the electroluminescent panel offers an additional opportunity for pioneering achievement in lighting design.

THE ULTIMATE possibilities of a thin, wide area, variable color, variable brightness light source with wide flexible applications are virtually boundless. The field of lighting esthetics has, in general, agreed that the controllable properties of light are its brightness, color, form, and changes or movement in these. The electroluminescent panel source is amenable to exacting control over these properties. Furthermore, if it lacks the directionality associated in a conventional sense with the incandescent point source or with the fluorescent linear source, it gains a form of directionality which is purely architectonic in concept.

Today one must speak of limitations in efficiency of the electroluminescent source and in panel size, of deficiencies in color range and stability, and of relatively high cost. These are problems in engineering and production which will, in all probability, be met in the not-too-distant future. Thus, while present applications tend to be small in scale and cautious, future applications can be less circumscribed. One may easily visualize an entire architectural space or a complete decorative treatment which is created and given identification by a controlled, molded, encompassing sheet of light.

Types of Electroluminescent Panels

The commercial electroluminescent panels presently available are all based upon a sandwich construction. The dielectric in which the luminescing phosphor is embedded, is surrounded by two layers of conductive material; one of these layers serves as the base or is supported in turn by a base, and the other layer is covered with a transparent plate. The base material may be of metal, glass, or plastic, giving rise to the designations metal, glass, or plastic electroluminescent panel. Table I summarizes some pertinent characteristics of the three principle types of electroluminescent panels.

Of the three types of panels, metal panels are presently the most economical and have the longest life. However, in large sizes, the panels tend to bow and warp due to differential expansion, a problem which is further complicated when the panel is non-symmetrical or irregular in form. In practice, therefore, the panel must be clamped or otherwise held in place if flatness is a desired characteristic. Furthermore, present experience in particularly the larger metal panels shows that the protective surface glaze may sometimes unsuspectingly be cracked if the handling has been careless or faulty. This can lead to dangerous shocks, or, sometimes to destruction of the lamp due to entering moisture. Present recommendations would be that, particularly in the larger sizes, metal lamps be encapsulated in plastic and then supported in a rigid housing before being placed in a fixture frame.

Glass panels produce a considerably higher efficiency than the other types, but are more expensive than the metal lamps and offer a shorter life. However, a glass lamp lies flat and by elimination of the bowing problem simplifies fixture construction and lamp replacement. Furthermore, since glass is a good insulator, the danger of shock is reduced. The glass layers are normally sealed with an epoxy, making the lamp impervious to moisture. Fig. 1 is

Table I—Characteristics of Commercial Electroluminescent Panels (600 Volts, 60 Cycles, Green)

	EL PANEL TYPE		
	METAL	GLASS	PLASTIC
Present Size Limitation (inches)	24 x 24	30 x 30	12 x 12
Efficiency (lumens/watt)	2-3	4-5	2-3
Half Life (hours)	15,000	5,000	1,500
Relative Cost (per cent)	60	100	120
Brightness (footlamberts)	8-10	8-10	6-8
Weight per Square Foot (lbs.)	1.6	2.6	1.38* .09**

*Rigid plastic—epoxy back
**Flexible plastic without leads

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 24-29, 1961, St. Louis, Mo. AUTHORS: Respectively, Kliegl Bros. Lighting, New York, N. Y.; and Westinghouse Electric Corp., Bloomfield, N. J.

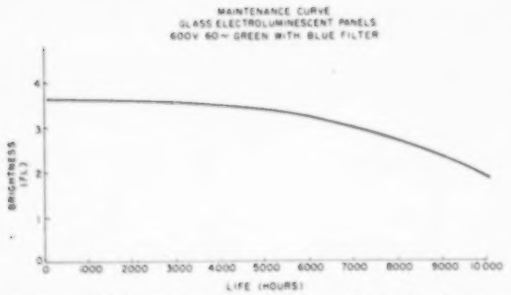

Figure 1. Maintenance curve, glass electroluminescent panel with blue filter.

the maintenance curve of brightness *vs* life of a glass electroluminescent panel with a blue filter.

Plastic panels are, at the present time, the most expensive of the three panel types, and have the shortest half life. However, they offer good insulating properties, and may be flat or quite flexible depending upon the thickness of the plastics used. At the present time plastic lamps must still be considered to be in the laboratory stage in terms of large scale electroluminescent panels.

In the case of the installation described later in this paper, samples of the glass and metal panels were obtained through the graciousness of cooperating manufacturers. These panels were made up to correspond to the largest panel (approximately 24 inches by 30 inches) in the prospective installation and were then tested under job conditions approximating those of the intended application. Tests included construction of a full-scale mock-up of the fixture support frame and complete wiring.

Color of Electroluminescent Panels

From a design point of view concern must be evidenced not only with the color of the lighted electroluminescent panel and with the possibility of changes in color under varying conditions of voltage and frequency. Also, of course, color rendition of persons, objects, and materials is of paramount importance. Methods of obtaining satisfactory color and changes in color in lighted panels have been well established in the literature and need no repetition here.[1,2] The unlighted panel from the standpoint of color appearance seems not to have been treated heretofore. The unlighted appearance is liable to be not satisfactory being a pallid gray, and under many circumstances further treatment will be considered a necessity. A dye additive in the protective lamp coating or in the phosphors offers a suggestion for future work. Colored glass, plastics, or other conventional color media may also be considered. In the case of the installation described in this paper, a sheet of colored plastic was bonded to the front surface of the electroluminescent panel. The lamp phosphors were chosen for the green range, and the overlay color filter was chosen in accordance with this, having a transmittance of between 40 to 50 per cent in this range. The unlighted appearance of these particular panels is, therefore, a medium blue, whereas the lighted appearance ranges from this blue through dark greenish blues, through a light aqua with increasing voltage.

For purposes of satisfactory color rendition, the blue-green electroluminescent panel lighting was supplemented with a quantity of incandescent downlighting. Since both sources are subject to full range dimming control, a satisfactory color balance may be achieved for any level of brightness applied to the electroluminescent panels.

Electrical Considerations

Electroluminescent panels are designed for a given brightness under given conditions of half life hours, voltage and frequency. Since it is frequently desirable to offer brightness variation, maximum operating voltage and frequency become the design parameters. Decreased voltage and/or frequency thereafter result in reduced brightness. Increase in frequency shortens electroluminescent panel life while increase in voltage (up to design rating) does not. Furthermore, various dimming controls (for example, auto-transformers and silicon controlled rectifier types) are already commercially available and seem to provide, under normal circumstances, a more reasonable approach to brightness control than do frequency change methods. Furthermore, such dimming systems may be manually or remotely

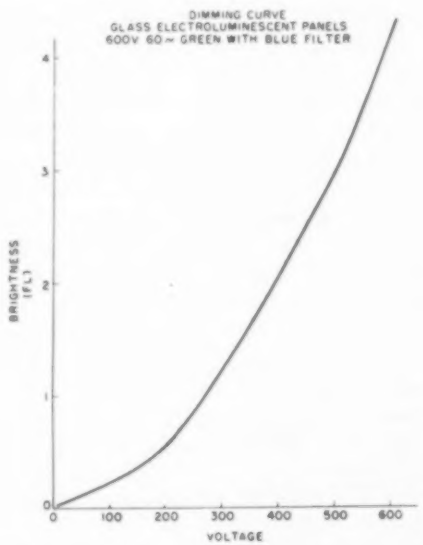

Figure 2. Dimming curve, glass electroluminescent panel with blue filter.

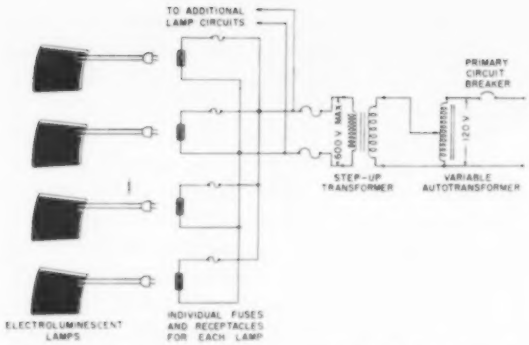

Figure 3. Wiring diagram for 600-volt, 60-cycle panels.

operated, preset and programmed, adding to their flexibility. Since available dimming systems are normally 120-volt maximum output, where panel design indicates operation at voltages above this level, the use of step-up transformers on the output end of the dimming devices is indicated.

Fig. 2 is a dimming curve of a green electroluminescent panel with a filter.

Fig. 3 shows a wiring diagram which may be considered for a system designed in conjunction with 600-volt panels. The entering supply voltage of 120 volts, single phase, alternating current, is connected through a primary protection circuit breaker to the primary of a continuously variable auto-transformer dimmer. The variable output of the dimmer feeds a step-up transformer, in this case with a turns ratio of 1:5. The secondary of the step-up transformer is isolated to meet code requirements from a safety standpoint and both output leads are protected by proper fusing. The output is then connected to the various electroluminescent panel plug-in receptacles. Since more than one lamp is connected to a single transformer, each receptacle feeds an individual lamp and is individually fused. Obviously, all components of the wiring system including plugs, receptacles, feeders and fuses must be chosen in accordance with code requirements. At 600 volts maximum standard components are available. The high voltage circuit is not grounded at any point; thus, no point in this circuit is fixed at 600 volts above ground. The ungrounded method prevents maintenance personnel from receiving lethal current through inadvertently contacting either side of the line. In the unlikely event that the circuit is contacted, no matter where the contact is made, that point becomes ground as it is then the only voltage reference point. An alternate procedure could be to ground the transformer secondary center top, fixing the maximum voltage above ground at 300 volts.

The Rice Hotel Installation

Let us now turn from our general discussion to that of a specific installation; the electroluminescent lighting system designed for the lobby of the Rice Hotel in Houston, Texas.[3] (See Fig. 4.) To the best of the authors' knowledge, this installation represents the largest square foot area use of electroluminescent panels ever attempted, and is, further, the first large scale permanent installation of electroluminescent panels.

Early in 1960, at the suggestion of the interior designer, investigation was started into the feasibility of the electroluminescent source for a specific application . . . the simulation of a large area "skylight" bearing the defining characteristics of a Texas sky from morning to evening. This skylight was intended as a central decorative treatment of the lobby for the famed Rice Hotel. Additionally, the designer's interest was in recapturing the charm and flavor of the original Rice Hotel lobby of some fifty years ago, but with the use of modern materials and design talent.

The lobby at the Rice Hotel is two story, supported by handsome square columns. The electroluminescent skylight is placed in the largest bay formed by these columns. It is in the form of an ellipse with major axis of 27 feet and minor axis of 19 feet. In the center of the ellipse, an area 11 feet by 7½ feet has been removed to provide for the installation of a crystal and brass chandelier. Ribs containing incandescent downlighting have also been provided. (See Figs. 5 and 6.)

The question may be asked as to why electrolumi-

Figure 4. Renovated Rice Hotel Lobby.

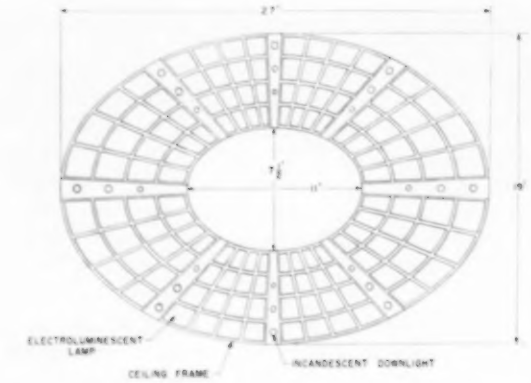

Figure 5. Outline drawing of the complete electroluminescent fixture.

Figure 6. Photograph of completed section of fixture with electroluminescent panels.

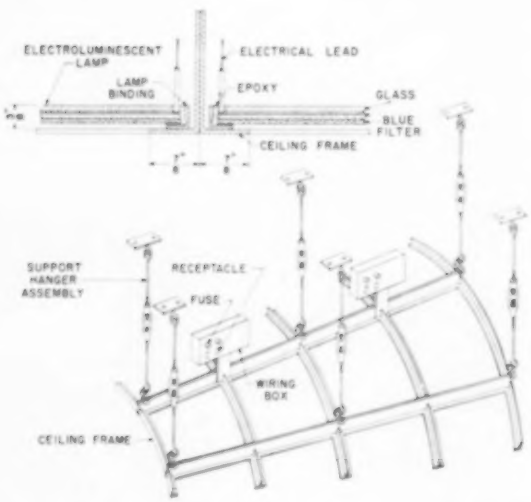

Figure 7. Fixture and electroluminescent panel detail.

nescent panels were used at all in this particular installation. The range of color, form, brightness required could be achieved in a variety of methods employing more conventional, more efficient, and less costly light sources.

One answer here is surely that the installation was meant to be a showpiece and, moreover, it was in *Texas*. A second reason for the use of electroluminescent panels was a natural curiosity as to their effectiveness for purposes combining architectural design, decorative effect and light production. The deciding factor was that while over most of the "skylight" slab-to-ceiling distances were in the order of eighteen inches to twenty-four inches, over other portions, these slab-to-ceiling distances were in the order of four inches, and a flat, thin, diffuse source was therefore required.

The designer had indicated an over-all elliptical shape to the skylight, and some early efforts were directed to ascertaining whether a single module panel might be used. It is of the utmost importance to the future use of electroluminescent panels that present technology was capable of producing economically, in this very first installation, a total of 32 panel shapes, and 64 different panel constructions (each shape is used twice and then reversed twice for a total of 128 electroluminescent panels.) For purposes of eventual lamp replacement, the 32 panel templates have been placed in storage.

The entire ellipse, frame and panels were calculated in terms of x and y coordinates on a computer. Since other subcontractors were supplying the central chandelier and a circumferential decorative molding, both computer readings and actual paper templates were furnished to subcontractors.

The fixture is constructed in a series of forty wedge-shaped pieces which are lifted individually onto the ceiling support hangers and then bolted together. Thirty-two of these pieces bear a total of 128 electroluminescent panels, while eight bear a total of twenty-four incandescent downlights. The initial load of the panels, comprising about 325 square feet in area, is calculated at 3240 volt-amperes at a power factor of 0.4; at 1000 hours the volt-amperes will be reduced to approximately 2600 at a power factor of 0.26. The incandescent downlights total 2850 watts and the central chandelier is approximately 1200 watts.

The fixture frame is matte gold and is finished in the Alzak process. A by-product of this installation was the finishing of probably among the largest single Alzak pieces using this process; the largest wedge is eight feet by almost three feet.

Earlier in this paper the various types of electroluminescent panels were described. Glass panels were utilized in this project, our main considerations being complete electrical safety and the ab-

sence of bowing and warping. The insert to Fig. 7 illustrates a cross-section of the panels and the fixture frame; Fig. 7 illustrates the method of frame support which we consider to be conventional, as well as the wiring system in which an outlet box feeds each set of four adjacent lamps. Fig. 8 shows a single panel, wire and plug.

The dimming bank for the entire lobby area employs motor-operated positioner-controlled autotransformers (Fig. 9), and contains additionally the step-up transformers for the lighting panels, as well as primary disconnects and all secondary circuit breakers. The dimmer panel is placed in a former storage area on the mezzanine of the lobby, while the small control panel (Fig. 10) is placed in the lobby itself. The lobby lighting is completely programmed in four preset levels by a clock-timing device, and a throw-over switch allows each dimmer to be operated individually as required.

Conclusions

The phenomenon of electroluminescence as evidenced by the panel light sources offers great possibilities in architectural and interior design and in the complete integration of these with lighting design. Electroluminescent panels are far from being a mere laboratory source. The chief deterrent to a major illuminating breakthrough for the panel source on the commercial market is its present low efficiency compared to more conventional sources. This point need not deter many architectural and design applications. In the major installation described in this paper, the designer's aims were achieved through the use of the electroluminescent source. It is problematical whether other sources would have resulted in as effective an installation.

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1. Ivey, Henry F.: Recent Advances in Luminescence. *IRE Transactions*, Vol. C. p. 4, No. 4 (December 1957).
2. Destriau, G., Ivey, H. F.: Electroluminescence and Related Topics. Vol. 43, No. 12 (December 1955).
3. For the Rice Hotel: Richard Kent, Inc., New York, interior designers; I. A. Naman and Associates, Houston, consulting engineers; J. Russ Baty, Houston, Architect; Max C. Peck, Manager.

DISCUSSION

R. D. Bradley:* Electroluminescent panels, are, undoubtedly, nearing the point, commercially, where they can be used in place of some of the more common sources. The large installation in the Rice Hotel is particularly interesting since other sources probably could have been used to produce approximately the same results.

The authors show the maintenance curve of glass electroluminescent panels with blue filters as their Fig. 1. Towards the end of life, it would be interesting to know what the mortality pattern might be, and what, if any, steps could

*Day-Brite Lighting, Inc., St. Louis, Mo.

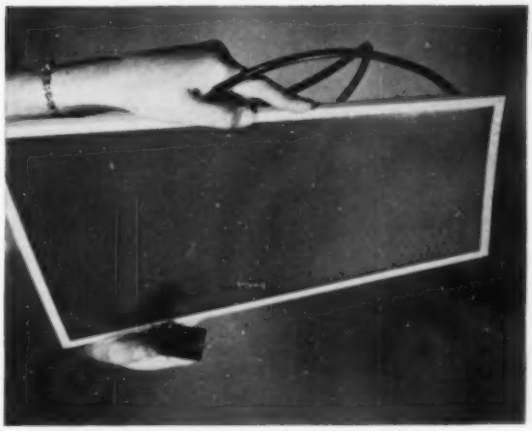


Figure 8. Completed electroluminescent panel.

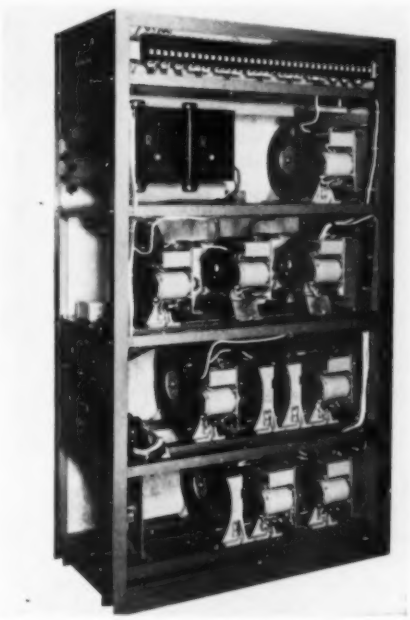


Figure 9. Dimming bank for lobby lighting.

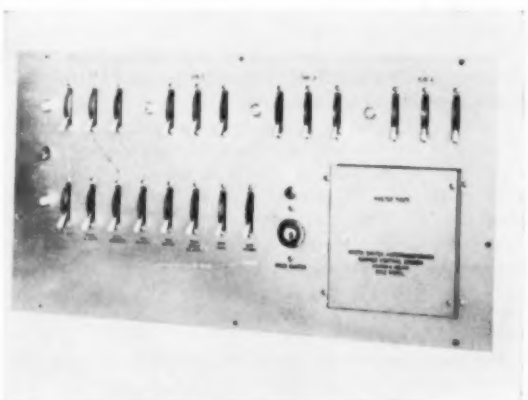


Figure 10. Lobby lighting control panel.

be taken toward partial replacement of panels without replacing all of them. The maintenance characteristics of this particular source is pretty flat beyond its half life, so that it is doubtful if much actual brightness difference would be noticed if the replacement panel could be seasoned to half life before installation. From examining this curve, it would appear that the brightness is a ratio of approximately 4.1 to 2.6, or a depreciation of some 37 per cent in the first 5000 hours. In the second 5000 hours, this curve remains quite flat so that the lumen output at the end of life would be in the order of a depreciation of 41 per cent. Would it be possible to replace some of the panels, if they were to fail completely, without replacing the whole installation?

It would have been interesting if the authors had mentioned dollars, since there are not many jobs which will be sold on the same basis as this one—where dollars did not count. Another expense in most installations would be correcting of the power factor, as it is noted that in this installation the power factor was approximately .3-.5.

The authors describe the light source as a glass electroluminescent panel having a green characteristic with a blue filter. For this particular job, undoubtedly, the sky blue characteristic was quite necessary; however, for other applications this might not be the case.

I presume that some doubling of lumens could be obtained if the panels were used with their normal green emission in place of the panels with the blue filter.

Fig. 9 shows the dimming bank for the complete fixture. It would be interesting to obtain an idea of the size and weight of the necessary step-up transformers providing the high voltage for connection to the panels. My limited knowledge of the necessary auxiliary equipment leads me to believe that, for an installation of this size or even smaller, a separate room would be necessary to hold this equipment. The author's comments would be appreciated.

SVEND W. BRUUN:* The electroluminescent panels described were designed with care to present an attractive appearance whether lighted or unlighted. It may be questioned whether the appended open-type crystal chandelier does not detract from the desired result, *i.e.*, that of suggesting the Texas sky. It is just possible that the chandelier tends toward a "gilding the lily" effect. The reflections from the high-brightness incandescent lamps can only reduce or even smother the soft glow of the lighted panels. A series of sparkling crystals following the perimeter of the "skylight" —or some similar treatment—might have offered less competition with the skylight.

The availability of shape, size, color and brightness of electroluminescent panels mentioned in this paper gives the designer an almost unlimited choice. This flexibility may well do more than any other factor to popularize the use of the panels. Apparently no application or size is too small or too large for these light sources.

I have been involved in the development of a new form of stairway or step lighting using electroluminescent panels, which will be installed integrally in outside granite stairways at Rutgers University in New Jersey. The panels, about two inches high, will run continuously along the base of each riser, with the stone slab overhanging and protecting the panels. The panels will be of metal encapsulated in clear plastic and backed by aluminum wire-ways. In this application, the selected brightness of three to four foot-lamberts appears to be ample.

For such applications, where relatively low brightness is proper and ample, I agree with the authors that there is no need to wait for the increases in brightness which some day will result from current laboratory research.

*Consulting Illuminating Engineer, Ridgewood, N. J.

J. E. RUBIN:* The discussers' comments have called attention to the fact that the paper included some preliminary calculations based on an installation of approximately 600 square feet of prototype panel rather than the final calculations based on the actual installation. The appropriate corrections have been made.

Answers to Mr. Bradley's specific questions follow. As to mortality pattern, we believe that under the conditions of use in the Rice Hotel lobby (12 to 16 hours of operation a day under varying levels) that somewhere between five and ten years following the initial turn-on (June, 1961), an over-all panel replacement may be desirable. At this point it is anticipated that the maximum brightness of the panels will be near two footlamberts. If some of the panels were to fail before this time, replacement could be made since the templates have been retained. One or more methods might be employed to insure that the brightness of the replacement panel corresponds with that of the existing panels: (a) a small resistance might be inserted in series with the feed to the replacement panel; or, (b) replacement panel might be speedily "aged" by applying a high frequency feed before installation.

In reference to cost, expenditure was definitely considered in this project—the hotel management was astute concerning this point. But, if the comments suggest that use of a different source might have permitted some economy, we might allow this point, still bearing in mind that the uniqueness, charm and quality of the installation have resulted in increased hotel traffic, as well as providing major assistance in generating an atmosphere of modernization, one of the aims of the management.

As to power factor, while the low power factor of the panels must be noted, the electroluminescent load in this installation (and, one would venture to guess, in most installations) is liable to be insignificant compared to the lighting loads operating at or near unity power factor.

Regarding brightness, had it been possible to use the electroluminescent panels without a covering filter, the brightnesses would have been approximately doubled.

As to auxiliary apparatus required, the dimming system shown in Figs. 9 and 10 is for the complete lobby lighting and equals some 60 kw. Step-up transformers and dimmers for the electroluminescent unit were 200 per cent oversized to allow for future installation of additional electroluminescent fixtures. Dimensions on the over-all system shown in Fig. 9 are 18 inches deep by 36 inches wide by 72 inches high, or 27 cubic feet. The portion of this committed to the panels, and including the oversizing, is approximately three cubic feet. If silicon controlled rectifier dimmers had been substituted for the motor-operated auto-transformer system, the cubage of the complete bank would have been reduced by at least one-half.

Finally, as to the possibility of substituting other light sources for electroluminescent, and whether this would result in as effective an installation, we believe that conclusion in the paper is modest and perhaps self-effacing. Mr. Bradley suggests that "other sources probably could have been used to produce approximately the same effect," while Mr. Bruun states that the installation "would hardly be possible if conventional glass and light sources were used." For the many reasons given in the paper and others enumerated here, we prefer to be associated with the latter view.

*Co-author.

Figure 1. Brooklyn Port Authority Pier 2 at dusk, with New York skyline in the background.

dramatizing port authority piers

by joseph milano

In Brooklyn, the Port of New York Authority's $90,000,000 Marine Terminal Development Program represents an unparalleled advance in the construction of modern pier structures. One of its unique features is that it does not disappear into the usual heterogeneous combination of indistinct black masses and twisted neon, at nightfall.

Eschewing the obvious and common device of a lighted sign, the facade lighting was planned to enhance the architectural form of each pier as well as meet the specific lighting objective of identification (Fig. 1).

At Brooklyn Pier 2, a straight row of eight-foot single-lamp fluorescent luminaires, mounted two in tandem to each ballast, is installed on the canopy roof (Fig. 2). A yoke assembly on the weatherproof luminaire housing permits vertical adjustment so that the light distribution can be focused, as desired, before the units are permanently locked in place. Light is reflected from the siding onto the back and side faces of the white porcelainized block lettering, silhouetting it aganst the night. Cool-white lamps are used to bathe the light blue ribbed aluminum siding so that these surfaces appear to be giving off a luminescent glow. To illuminate the truck back-up area, recessed weatherproof canopy luminaires with 150-watt incandescent lamps were installed on 16-foot centers. These pro-

Author: Marine Terminals Department, The Port of New York Authority, New York, N. Y.

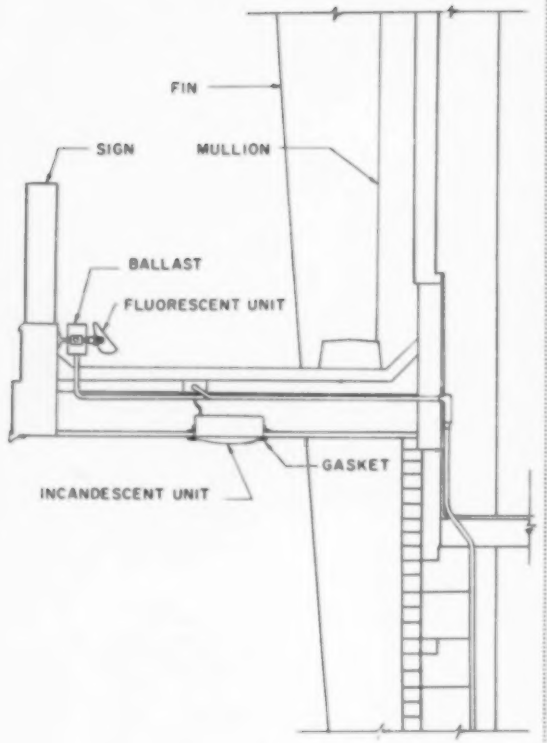


Figure 2. Section of the Pier 2 canopy showing relative orientation of fluorescent and incandescent units.

vide adequate work lighting, and, at the same time, present a neutral rendering of the trucking activity to the casual onlooker who is attracted to the light-emphasized areas above the canopy.

A slight variation in the basic concept was introduced with the planning of the architectural lighting for Brooklyn Pier 6 (Fig. 3) where the facade illumination included the office core area, thereby achieving greater area unity. The light intensity is the same throughout the width of the building, with interest created at the office center by dark blue spaced vertical mullions.

Brooklyn Pier 7 represents a departure in the architectural lighting requirements typical of the other Port Authority Marine Terminal structures. Here the three-story office core rises above and moves outward from the main cargo shed (Fig. 4). In addition, the number of surfaces that require lighting, both in type and planes of orientation, is greater than on the other piers. A 33-foot metal and glass curtain wall is topped by a three-foot soffit and an eave of white panels. Extending downward from the soffit to the top of the entrance canopy is a gold anodized ornamental aluminum grille. Two vertical dark blue fins bracket the office facade against the rest of the pier, whose exterior lighting design is similar to that at Brooklyn Pier 2.

In planning the use of light to enhance the architectural design of the office core, the eave and curtain wall soffits were used to maximum advantage. A row of recessed baffled downlights, in the eave soffit, spaced on six-foot, seven-inch centers and lamped with 150-watt PAR floods, acts as a pri-

Figure 3. Brooklyn Port Authority Pier 6 showing the fluorescent luminaires mounted on the canopy.

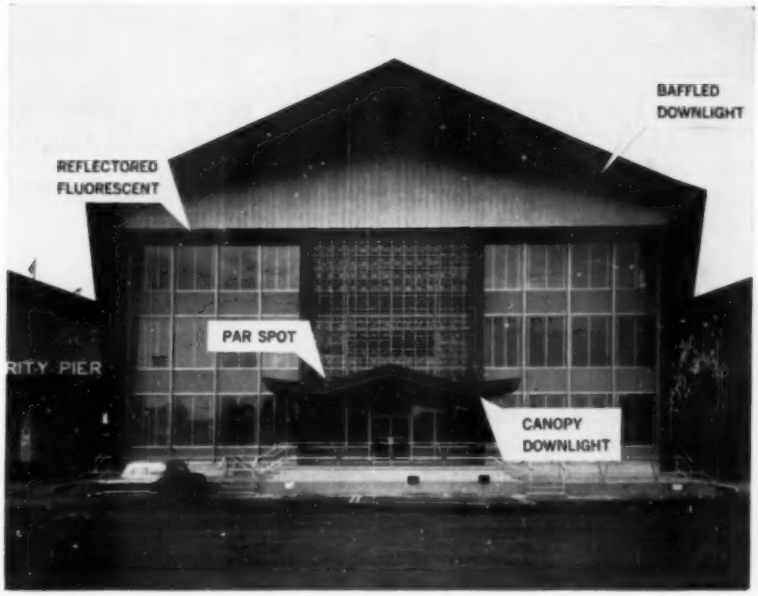


Figure 4. Front view of office core facade of Brooklyn Port Authority Pier 7.

mary light source for the grille surface (Fig. 5). These luminaires are hinged to permit relamping from the interior of the building.

Four 150-watt PAR spots, surface mounted on the roof of the entrance canopy, act as a secondary grille light source and thus provide the crosslighting to highlight structural depth. A row of single-lamp, four-foot, high-output, reflectored fluorescent luminaires, recessed in the curtain wall soffit, provides a modulated blanket of light, visually separating the glass and light blue aluminum panels of the wall from surrounding surfaces. Each fluorescent housing is spaced on six-foot, seven inch centers and can be pivoted for interior relamping. The clear acrylic plastic enclosures for the units are fixed in the soffit.

A double row of recessed incandescent downlights in the entrance canopy establishes a safe brightness zone for the walk and steps. To provide shielding and diffusion for the 150-watt lamps, an opal lens seals the aperture of each luminaire.

In the lobby clusters of decorative glass globe light assemblies are staggered at different levels over the modern open-riser stairs, lending sparkle to the over-all lighting design.

The blend of incandescent and fluorescent light sources has eliminated the problem of color rendition or "dirtiness" at Brooklyn Pier 7, even in contrast with the mercury upland lighting. This combination of planned architectural lighting with deep upland areas has created visual waterfront values which complement the magnificent view of lower Manhattan and the Brooklyn Bridge.

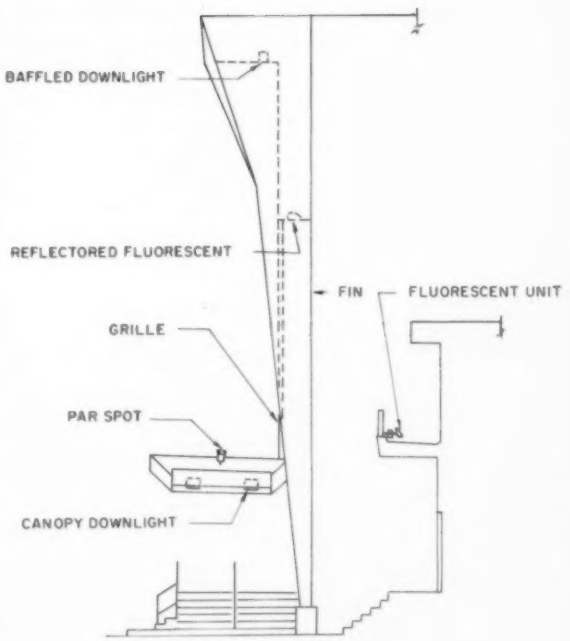


Figure 5. Section of the Pier 7 facade with the locations of all architectural lighting units shown.

RELIGHTING AIDS

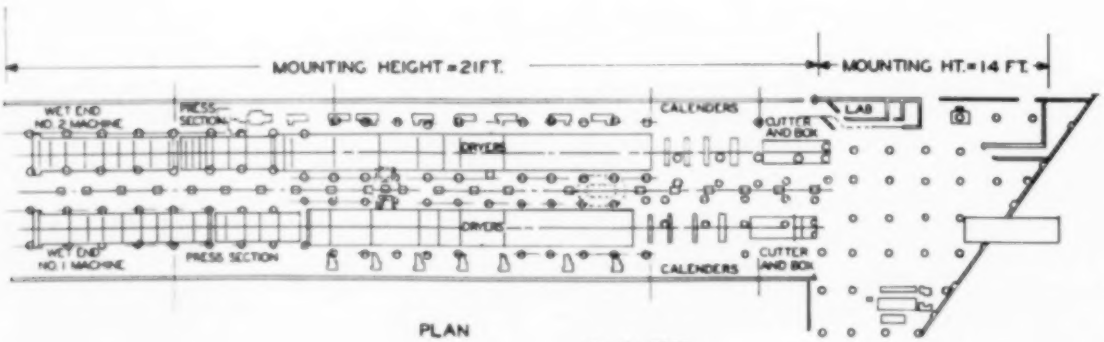
HIGHLY increased efficiency at Continental Paper Co., Ridgefield Park, N. J., has been credited to its newly installed mercury lighting system. Since its installation the company has had effective board inspection, more rapid correction of causes of board imperfections, fewer rejects and fewer customer returns. This relighting started with a few new lights to replace a partially closed-in skylight that leaked dirt and water, and was bothersome to maintain, and mushroomed into a full-fledged relighting program which will take more than two years to complete.

The first new mercury units were installed over the wet end of No. 1 Machine. Almost immediately the quality of the board from this machine began to improve because the machine tenders were better able to see what they were doing, and any visible streaks or other defects discernible at this stage could be detected and steps taken to eliminate them. Operators on No. 2 Machine complained that the No. 1 crew was turning out better board because their lighting was so much better, and requested that the maintenance department move faster in installing new lights for No. 2 Machine.

The benefits of the new wet-end lighting were so overwhelmingly apparent that as soon as this lighting was completed, the cutter-box area was relighted. When this area was relighted, it became possible to flip out most bad board as it was cut and to take measures to correct repetitive defects while the web was running. Formerly, only major defects were detectable at the cutter-boxes, so that the defects now discovered at the boxes were not discovered until finished inspection.

Almost simultaneous with cutter-box relighting, was finished inspection relighting. The result here was improved culling out of any bad board not caught at the boxes, thus preventing its shipment to the customer. Therefore, without any changes except relighting, the company's quality control efforts have been vastly improved. Other benefits of higher lighting levels include improved operating conditions and better housekeeping, since the improved lighting shows up grease accumulations, grit and trimmings that otherwise tend to go unnoticed.

AUTHOR: Manager, Industrial Lighting, Holophane Co., Inc., New York, N. Y.



LIGHTING LAYOUT DETAILS

SYMBOL	No. of Units REQUIRED	LAMP DATA			CONNECTED LOAD	
		NO. PER UNIT OR SECTION	TYPE & RATING	TOTAL LAMPS REQUIRED	PER UNIT	TOTAL
O	140	1	400W H33-1- GL/C	140	435	50.9KW

Lighting layout—indicating spacing of 400-watt mercury machine-room lighting fixtures.

QUALITY CONTROL IN PAPER MILL

By Daniel J. O'Neill

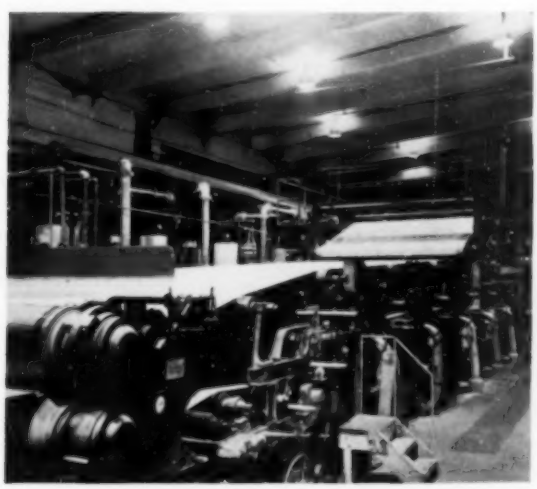
Since inauguration of the relighting program, some 100 new 400-watt mercury fixtures have been installed. At least 100 more will be installed during the next year. The grit-removal room and a beater room have already been relighted; the rest of the plant is still on the agenda. The table below compares illumination levels before and after relighting.

AREA	ILLUMINATION LEVEL IN FOOTCANDLES	
	OLD	NEW
Machines 1, 2		
Wet ends	15	65
Cutter-box ends	20	110
Dryer sections	5-10	50-60*
Finished Inspection	5	90
Beater Room	5	20
Pulper-feeding Stations	5	120

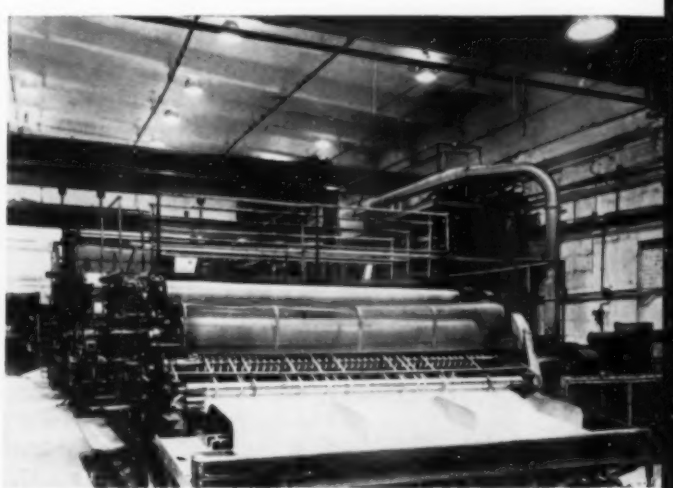
*As dryer sections have not yet been relighted, this is an estimated lighting level.

The open-bottom "low-bay" fixtures in the machine room are on 16-foot centers. The inverted-bowl-shaped fixture-reflectors are of prismatic glass and are housed in protective metal covers. The reflectors have top-to-bottom optically-precise prismatic corrugations molded on the outer surface, and these prisms direct the light downward within a 120-degree cone. This prismatic control, plus the fact that the reflector extends well below the bottom of the lamp, minimizes glare. The reflectors are open at the top, providing an upward component of light and creating a chimney effect that carries dust through the unit, minimizing the dust that will collect on the inner surface of the glass reflector.

In undertaking the relighting project, the company's maintenance department has scheduled the work into its regular program, hence the projected completion date. In most locations new distribution lines are brought in from the turbine room, since existing circuits are not sufficient to carry the load required for the new lighting installations. In the grit-removal room, however, the lighting level was increased to 25 footcandles from 20 footcandles merely by substituting 400-watt mercury equipment for existing 1000-watt incandescent equipment, as the mercury lighting requires much less power per footcandle than incandescent.



Wet ends. Installation of new mercury lighting system raised illumination level from 15 to 65 fc.



Cutter box ends. Lighting level of 110 fc makes it possible to catch and correct defective boards while running.

INSTALLATION AT DAFFIN MANUFACTURING CO., LANCASTER, PA.

Lighting for Rough Metal Working

LIGHTING OBJECTIVE: To provide general illumination for rough assembly of large metal parts.

GENERAL INFORMATION: Metal cutting and bending, torch cutting, welding, and other large assembly work take place in this space which measures 240 feet long by 50 feet wide. Trusses are 20 feet above the floor and the sloping roof is approximately 5 feet above the bottom of the trusses. Colors and reflectances of the major surfaces are:

Floors	Concrete, unpainted	30% RF
Walls	Concrete block	40% RF
Trusses	Grey	30% RF
Metal Ceiling	Grey	30% RF

INSTALLATION: There are 72 Miller Co. catalog No. IX-2501-08 industrial type slotted top luminaires suspended 20 feet above the floor at truss height to clear the travelling crane. Each unit is equipped with two 96-inch PG-17 1500 ma cool white lamps. Units are chain suspension mounted in groups of two to make 36 sixteen-foot units. These are spaced on 20-foot centers in three rows 17 feet apart.

The average illumination level after two years operation is 65 footeandles.

Lighting designed by F. M. Gochenaur, Lighting and Wiring Specialist, Pennsylvania Power and Light Co., in cooperation with Harry Gochenaur, Electrical Contractor, East Petersburg, Pa.

Lighting data submitted by F. M. Gochenaur, Lighting and Wiring Specialist, Lancaster Division, Pennsylvania Power and Light Co., Lancaster, Pa.

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Comparisons of Recessed
Ceiling-Mounted
Suspended

OFFICE LIGHTING SYSTEMS

C. L. Amick, R. D. Bradley

Dozens of recessed, ceiling-mounted and suspended luminaire prototypes are available for office illumination systems and usually each prototype has many variations in size and components. This paper summarizes esthetic, cost and comfort factors for certain widely used luminaire types. Visual comfort is believed to be of prime importance, and designers should use glare-evaluation data to insure customer satisfaction as automatically as utilization data is employed to be sure of attaining recommended footcandle levels. Total annual cost is usually a more significant index of lighting economics than initial cost. Ceiling-mounted and suspended systems are generally lower in cost than recessed systems, though the difference would often be considered small enough to permit wide latitude by architects and building designers in achieving desired spatial characteristics.

PERHAPS the greatest problem facing the designer and specifier of illuminating systems for offices today is the selection of lighting equipment appropriate from esthetic, cost and comfort standpoints. Questions of footcandle standards for various office seeing tasks have been answered by recommended illumination levels adopted by the IES in 1958, based on extensive research data obtained by Dr. Blackwell and his associates. Utilization data are provided by equipment manufacturers to facilitate easy calculation of the number of general-lighting luminaires needed. Lamp companies publish lumen maintenance characteristics of light sources, making possible more accurate estimates of maintenance factors. However, the illuminating engineer tackling a new office building or the relighting of an existing office area faces a wide variety of choices about luminaire types, including:

(1) Relation of lighting equipment to the ceiling plane—should luminaires be recessed, ceiling-mounted or suspended?

(2) Light source—fluorescent lamps are ordinarily the logical choice for general lighting in offices, but what type and size is best?

(3) Type of shielding element—should brightness control be obtained by opaque reflectors and side panels, by diffusing glass or plastic materials, by prismatic treatments, by louvers, or by some combination of these.

Esthetics

In the past, many lighting practitioners used a simple "commercial" *vs.* "industrial" yardstick to determine which luminaires were appropriate for office areas. Today, there is evidence of the greater role architects and decorators are taking in luminaire selection to insure harmony with broad esthetic objectives of the entire space. In large, new structures, engineers can anticipate general direction, likely to come from the building designer, with regard to the luminaire prototype to be employed. In many cases, instructions will specify relation to the ceiling plane (recessed, surface-mounted or suspended) and the approximate styling or enclosure texture desired. But there are still many choices left for the lighting engineer!

It is beyond the scope of this paper to detail the appearance considerations which affect the selection of office lighting equipment. Obviously, lighting equipment can be recessed into acoustical ceiling material to achieve a smooth surface which provides sound conditioning, and to hide overhead pipes, ducts, wires, etc. Combination lighting-air handling luminaires can eliminate the need for conventional air diffusers, thus providing the additional function of room cooling and heating. The desire for uncluttered ceilings and the trend toward reduced room heights have undoubtedly been dominant factors leading to widespread use of recessed lighting.

Ceiling-mounted luminaires are also used more extensively today, again reflecting the growing percentage of lower ceiling areas, and the apparently increasing esthetic objection by architects and owners to suspension of fluorescent luminaires, individually or in rows, because of the "inverted forests" they are believed to simulate. However, surface-mounted lighting equipment offers problems

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of ceiling brightness uniformity, and the efficiency-comfort conflict is perennial in the design of such luminaires.

Suspended luminaires still enjoy wide acceptance, particularly for the relighting of existing offices having ceiling heights of 10 feet or more. Economical and comfortable illumination systems can be provided with high-reflectance ceilings and direct-indirect luminaires designed to present relatively low brightness in the normal field of view, and with good appearance of the lighted room when the ceiling height is appropriate for selection of such luminaires.

Large floating-panel suspended luminaires simulate the appearance of wall-to-wall transilluminated systems, but without the expense of custom fitting to exact room dimensions and with freedom from certain in-service maintenance problems which have plagued many installations of thin luminous-ceiling materials. The advisability of "bland environments"[1] which may result naturally will remain an esthetic consideration.

Lighting Costs

To make realistic comparisons of initial, operating and total annual costs for various luminaire types, it was assumed that the designer was lighting a medium-sized general office, 40 by 60 feet in size, with a ten-foot ceiling height. Modern room surfaces (80 per cent ceiling, 50 per cent walls and 30 per cent floors) were also assumed and detailed cost tables were developed for dozens of lamp and luminaire combinations to produce 100 footcandles minimum in service, the present recommended level for regular office work.[2]

The coefficients of utilization were calculated by current methods and maintenance factors estimated on the basis of "terminal" lamp and luminaire depreciation before some maintenance procedure is instituted, as recommended by the Society. Published lumen maintenance characteristics were used to determine the lamp output up to the point of group relamping, then multiplied by appropriate factors to allow for dirt collection on lamp and luminaire surfaces.

Installation costs include the published contractor price of the lighting equipment plus labor estimates based on the experience of a St. Louis electrical contractor for installation and branch circuits. Lamp outages between group replacement intervals are spot replaced at a cost of $1.00 and $1.25 each for four- and eight-foot lamps, respec-

Table I—Comparative Costs for Typical Recessed, Ceiling-Mounted and Suspended Luminaires

	LUMINAIRE TYPE	LAMP TYPE	INITIAL COST		ANNUAL OPERATING COST		TOTAL ANNUAL COST	
			DOLLARS	RANK*	DOLLARS	RANK*	DOLLARS	RANK*
RECESSED	Troffers with clear, ribbed-plastic enclosures							
	12-inch wide	Two 40w RS	3470	9	545	7	1030	8
	24-inch wide	Two 40w RS	3960	11	467	1	1045	9
	24-inch wide	Four 40w RS	2840	6	502	4	905	4
CEILING-MOUNTED	Plastic-enclosed (prismatic-bottom, diffusing sides)							
	10-inch wide	Two 40w RS	2670	5	557	8	945	5
	14-inch wide	Four 40w RS	2240	2	592	10	905	4
	Plastic-enclosed (Acrylic prismatic wrap-around)	Two 40w RS	4330	13	520	5	1170	10
	Double-wall diffusing plastic-sides and louvered bottom							
	16-inch wide	Two 40w RS	3740	10	650	11	1185	11
	24-inch wide	Four 40w RS	3100	7	568	9	1005	6
	Shallow, opaque-sided with clear, ribbed-plastic enclosure							
	12-inch wide	Two 40w RS	3340	8	545	7	1020	7
	23-inch wide	Four 40w RS	2350	3	487	2	820	2
SUSPENDED	Direct-indirect with opaque sides and louvered bottom							
	13-inch wide	Two 40w RS	2500	4	537	6	893	3
	21-inch wide	Four 40w RS	2200	1	498	3	810	1
	Luminous indirect	Two 40w RS	4180	12	712	12	1310	12

*Rank among the luminaire prototypes included in the table.

tively. Group replacement costs were assumed to be 20 and 25 cents each for four- and eight-foot lamps, respectively. Calculations were based on 3120 burning hours per year ten hours per day, six days per week and 52 weeks per year, at an energy rate of 1.5 cents per kilowatt-hour.

Recessed vs. Ceiling-Mounted vs. Suspended Luminaires

A frequent question concerns the economic relation of recessed, ceiling-mounted and suspended luminaires. Table I summarizes these calculations for a variety of popular systems. The number preceding the lamp identification in column 2 gives the number of lamp rows per luminaire. In some cases, the costs were based on more economical tandem-lamp luminaires using eight-foot bodies.

While the specific luminaires are typical of many commercially available from a variety of manufacturers, the initial costs could be higher or lower depending upon the price range of equipment selected. Since our tabulation is based on a consistent quality level, a few generalizations are believed to be reliable:

(1) If the ceiling is high enough to permit suspended luminaires, the four-lamp direct-indirect type is lowest of the types covered in Table I, from the standpoint of initial and total annual cost. The four-lamp opaque-sided, ceiling-mounted unit is a close second on over-all cost.

(2) The most economical recessed system is still somewhat more expensive than the lowest cost ceiling-mounted and suspended systems, but the two-lamp, 24-inch wide troffer is best from the standpoint of operating cost, because it has favorable utilization and maintenance characteristics.

(3) The fairly wide range of initial, operating and total annual costs within a given category (recessed, ceiling-mounted or suspended) makes it difficult to draw broad generalizations. Progressive lighting recommendations should not ordinarily hinge on aspects of economics anyway, since visual comfort and esthetics are such important factors in office areas.

In general, higher lamp lumens per luminaire, accomplished by more rows of lamps or the use of higher output sources, results in reduced over-all lighting costs, provided the coefficient of utilization, maintenance factor and over-all lamp lumens per watt are not proportionately affected. Such examples can be seen in Table I. As prevailing illumination levels increase, both economic and esthetic considerations suggest greater use of more lamps and/or higher output lamps per luminaire. The amortized luminaire cost nearly always becomes a smaller portion of the total annual cost as

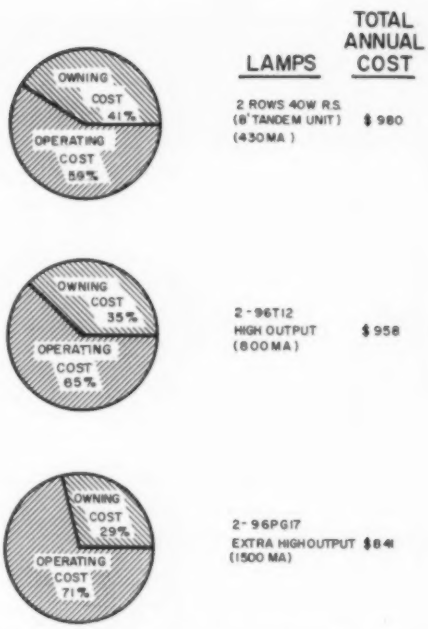

Figure 1. Higher lamp lumens per luminaire generally reduce the initial investment, expressed as a percentage of total annual cost. These three systems use the same direct-indirect luminaires for two rows of fluorescent lamps. Opaque side panels are used; bottom louvers provide 45- by 45-degree shielding with T-12 lamps.

lamp lumens per luminaire increase. (See Fig. 1.)

Electrical energy costs make up the dominant portion (67 to 77 per cent) of the operating cost for the examples chosen. If energy rates are higher or lower than the 1½ cents per kwh used in calculations upon which this paper is based, the above percentage will shift in the same direction, as will the relative proportion of operating cost to total annual cost. Fig. 2 shows the affect of other energy rates for the opaque-sided, direct-indirect luminaire with four rows of lamps.

"Burning hours per year" is also an important factor in determining operating costs. Electrical energy changes and lamp costs are directly affected by the amount of time which the lighting system is operated. Some variations in burning hours have been noted but office practice usually involves about 10 hours of daily service. In general areas, such as those used for these computations, the luminaires are rarely turned off during the noon lunch hour and experience shows that whether one employee or a larger group is in on Saturday, the entire general office lighting system is turned on. The difference in annual burning hours between nine hours per day, five days per week *and* ten hours per day, six days per week is only 780 hours, far less than the difference in operating time of single *vs.* multiple-shift factory schedules. Therefore, in

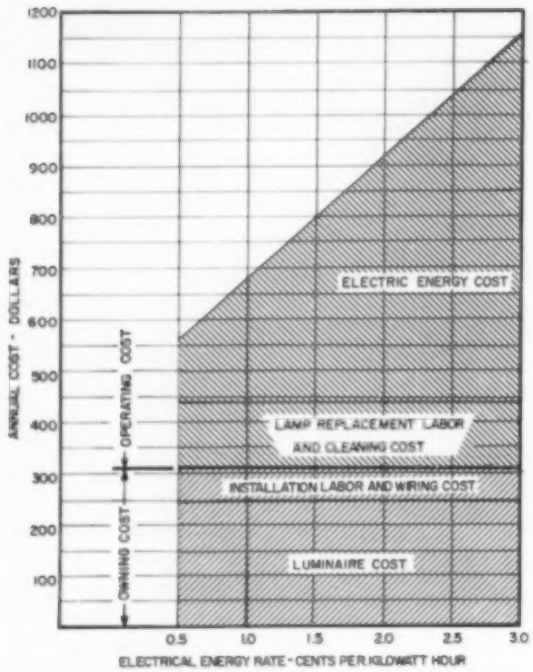

Figure 2. The operating and total annual costs are affected by the electrical energy rate in the proportions shown for a typical direct-indirect suspended luminaire with four rows of 40-watt lamps.

the selection of lighting equipment for offices, less importance can be placed on graphical presentations which show "break-even" burning hours for various energy rates, more widely applicable to school illumination and other situations involving relatively low total operating hours per year.

Which Lamp to Select from the Lighting Cost Standpoint?

This question arises because many commercial-type fluorescent lamp luminaires are available for 40-watt rapid-start lamps or for 96-inch, T-12 slimline lamps. Certain other models are occasionally *also* furnished with high-output (800-ma) lamps, and a few luminaires are available for 1500-ma extra-high-output lamps as well. Fig. 3 shows the installed and total annual costs (divided into owning and operating costs) for a popular two-lamp metal-sided, direct-indirect, louvered-bottom unit with 45- by 45-degree shielding of T-12 lamps. The enclosure is identical except that the tops of the louvers are notched for the PG-17 type of extra-high-output lamp employed.

While Fig. 3 is not expected to apply with equal accuracy to all commercial-luminaire prototypes, it does show that the extra-high-output lamp minimizes initial investment, and compares favorably with the 40-watt rapid-start lamp for over-all economy. Differences in total annual costs among the three lamp types are not considered overwhelming enough to overcome the greater role which comfort is believed to play in office-lighting luminaire selection (see later section of paper).

If four-lamp, 430-ma and 800-ma luminaires are compared with two-lamp extra-high-output luminaires of a given type, calculations show major advantages in current total annual cost for four-lamp, 800-ma equipment. The four-lamp, 430-ma units are not as economical as the 800-ma luminaires, but show up better than the extra-high-output. This relationship is expected to change when improved lumen-maintenance characteristics are announced for 1500-ma lamps. In evaluating cost comparison data from different manufacturers, it is particularly important to be sure that all maintenance factors have been estimated on the same basis; the "terminal" concept recommended by IES has been employed in all calculations of this paper, but many examples to the contrary have been noted from other sources.

General conclusions about lamp selection include:

(1) For the annual lighting-system usage of typical office areas, and the electrical energy rates common in the United States, fluorescent-lamp equipment is considerably lower in total annual cost than filament-lamp luminaires.

(2) The newer types of mercury lamps are vastly

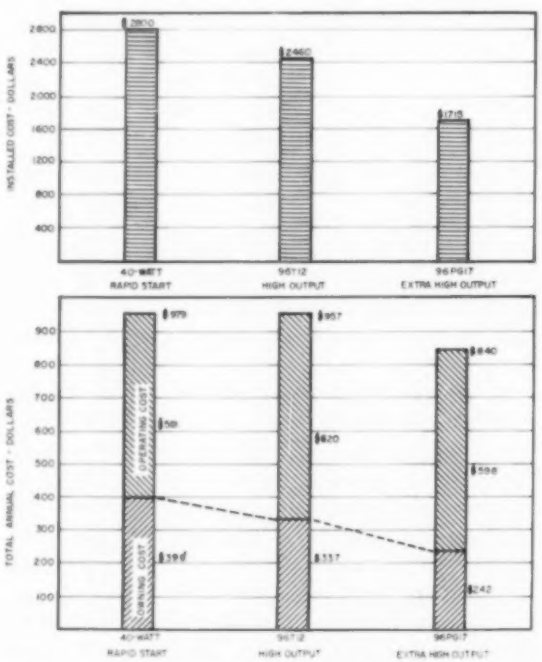

Figure 3. Installed and total annual costs for three different lamp outputs per foot.

superior in color rendition to earlier lamps, but are not believed to be close enough in "whiteness" for completely satisfactory office-lighting service.

(3) Wherever possible, maximum numbers of eight-foot fluorescent lamp luminaires should be used to make up continuous rows. Eight-foot sections using 40-watt lamps in tandem are ordinarily lower in cost than two corresponding four-foot units. The cost of electrical components and wiring time by the luminaire manufacturer often favors the eight-foot slimline version over the 40-watt.

(4) The 40-watt T-12 lamp with higher light output than the standard lamp lowers the number of luminaires required and results in slightly lower installed and total annual cost.

(5) The most popular light-source for troffers is the four-foot, 40-watt lamp. Slimline lamps eight-feet long have been employed to a limited extent for 12-inch wide flange and snap-in troffers, but such luminaires have generally used four-foot enclosures for easier handling and maintenance.

The Influence of Shielding Elements On Lighting Costs

Specifiers today have an almost confusing array of enclosing materials from which to select. Five years ago, one of the authors made a comprehensive study of utilization, cost, and comfort for 24 of these materials in shallow, 12-inch wide troffers; since that time, many new shielding elements adaptable to fluorescent-lamp luminaires have become commercially available.

Cost information for several 12- and 24-inch wide troffers and 24-inch wide opaque-sided ceiling-mounted units are summarized in Table II. Many other kinds of shielding elements have been tested, but popular types tabulated illustrate the economic end result of variations in utilization and component costs. All employ 40-watt rapid-start lamps, and the same 40 by 60 general office area is assumed.

Table II—Influence of Shielding Elements

LUMINAIRE AND SHIELDING	ROWS OF 40-WATT LAMPS	IN-STALLED COST	ANNUAL OPER-ATING COST	TOTAL ANNUAL COST
12-Inch Wide Troffers				
Clear ribbed plastic	2	$3470	$ 545	$1030
Dropped diffusing plastic	2	4370	582	1210
Concave plastic lens	2	4790	563	1258
Low-brightness glass	2	3840	522	1080
⅝-by-⅝-inch, 45-degree plastic louvers	2	4660	708	1377
Parabolic aluminum troffers with formed louvers				
12-inch wide	2	5400	665	1440
24-inch wide	4	5030	625	1350
24-Inch Wide Troffers				
Clear ribbed plastic	2	3960	467	1045
Dropped diffusing plastic	2	5570	528	1341
Concave plastic lens	2	6170	497	1400
Low-brightness glass	2	4920	467	1185
⅝-by-⅝-inch, 45-degree plastic louvers	2	5263	598	1366
24-Inch Wide Troffers				
Clear ribbed plastic	4	2840	502	905
Dropped diffusing plastic	4	3730	535	1055
Concave plastic lens	4	3890	502	1065
Low-brightness glass	4	3250	479	948
⅝-by-⅝-inch, 45-degree plastic louvers	4	3570	613	1120
24-Inch Wide Opaque-Sided Ceiling-Mounted Luminaires				
Clear ribbed plastic	4	2350	487	820
Concave plastic lens	4	3490	510	855
Low-brightness glass	4	2730	465	1010
⅝-by-⅝-inch, 45-degree plastic louvers	4	3120	626	1065

Troffer Width vs. Ceiling Tile Requirements

In considering what width of troffers will be used, the designer should keep in mind that some installations of 24-inch wide units require less area of ceiling tile than comparable shielding elements in 12-inch wide luminaires. In such cases, the savings in the ceiling system could properly be charged to the lighting system which requires the greater amount of tile. For example, if acoustical panels at 60 cents per square foot are added to the installed cost of two-lamp, 12-inch wide troffers, the total annual cost actually becomes slightly higher than a two-lamp, 24-inch wide recessed system, when the clear ribbed plastic or ⅝- by ⅝-inch, 45-degree plastic louver enclosure is involved. Evaluated on this basis, the advantages of lower brightness and improved comfort provided by the two-lamp, 24-inch troffer (compared with two-lamp, 12-inch wide systems) actually come as an economic bonus. It is about the only instance in lighting where one can have his cake and eat it too!

Utilization and Wattage vs. Air-Conditioning Costs

Most modern office spaces are artificially cooled during the summer season. In many cases, with present recommended illumination levels, the inner areas of buildings would be cooled all or nearly all year. Engineers must therefore consider the

heat load of lamps and ballasts in determining the capacity of air-conditioning equipment.

For example, the reduced trapping of light in a two-lamp, 24-inch wide troffer results in an efficiency of 68.8 per cent with a clear, ribbed plastic enclosure. In the 40- by 60- by 10-foot office with 80-50-30 room surface reflectances, such luminaires have a utilization of 0.73, compared with 0.63 for either a two-lamp, 12-inch wide troffer or a four-lamp, 24-inch wide troffer. The saving in total

Table III—Visual Comfort of Typical Recessed, Ceiling-Mounted and Suspended Luminaires

	LUMINAIRE TYPE	NUMBER OF LAMP ROWS	LAMP TYPE	INITIAL GLARE FACTORS		MAXIMUM BRIGHTNESS AT NADIR FOOTLAMBERTS
				CROSSWISE	LENGTHWISE	
RECESSED	12-Inch Wide Troffers					
	Clear ribbed plastic	2	40w RS	87	92	1830
	Dropped diffusing plastic	2	40w RS	309	282	1220
	Concave plastic lens	2	40w RS	73	89	2470
	Low-brightness glass	2	40w RS	55	95	2070
	⅝-by-⅝-inch, 45-degree plastic louvers	2	40w RS	73	73	2470
	Parabolic aluminum with formed louvers	2	40w RS	9	32	2410
	24-Inch Wide Troffers					
	Clear ribbed plastic	2	40w RS	37	55	1350
	Dropped diffusing plastic	2	40w RS	136	129	610
	Concave plastic lens	2	40w RS	28	29	1990
	Low-brightness glass	2	40w RS	32	41	2140
	⅝-by-⅝-inch, 45-degree plastic louvers	2	40w RS	51	53	2150
	24-Inch Wide Troffers					
	Clear ribbed plastic	4	40w RS	55	79	1870
	Dropped diffusing plastic	4	40w RS	235	223	1180
	Concave plastic lens	4	40w RS	59	69	2540
	Low-brightness glass	4	40w RS	59	83	2330
	⅝-by-⅝-inch, 45-degree plastic louvers	4	40w RS	92	106	2470
	Parabolic aluminum with formed louvers	4	40w RS	9	32	2410
CEILING-MOUNTED	Plastic-enclosed (prismatic bottom, diffusing sides)					
	10-inch wide	2	40w RS	53	81	2410
	14-inch wide	4	40w RS	88	98	2850
	Plastic-enclosed (acrylic prismatic wrap-around)	2	40w RS	68	40	2500
	Double-wall diffusing plastic sides and louvered bottom					
	16-inch wide	2	40w RS	34	42	2800
	16-inch wide with formed aluminum louvers	2	40w RS	17	24	2780
	24-inch wide	4	40w RS	50	60	2800
	Shallow, opaque-sided, 12-inch wide					
	Clear ribbed plastic	2	40w RS	80	90	2300
	Shallow, opaque-sided, 23-inch wide					
	Clear ribbed plastic	4	40w RS	70	103	1960
	Concave plastic lens	4	40w RS	70	75	2400
	Low-brightness glass	4	40w RS	86	100	2270
	⅝-by-⅝-inch, 45-degree plastic louvers	4	40w RS	79	91	2540
SUSPENDED	Direct-indirect with opaque sides and louvered bottom					
	11-inch wide	2	40w RS	12	13	2340
	11-inch wide	2	96T12 HORS	28	29	3200
	11-inch wide	2	96PG17	33	37	4800
	13-inch wide	2	40w RS	16	17	2380
	13-inch wide	2	96T12 Slim.	12	13	2470
	21-inch wide	4	40w RS	15	17	2600
	Luminous indirect	2	40w RS	6*	2*	185
	Luminous indirect	2	96T12 HORS	8*	3*	250

*Glare factors for luminaires only. Does not include glare effect of ceiling.

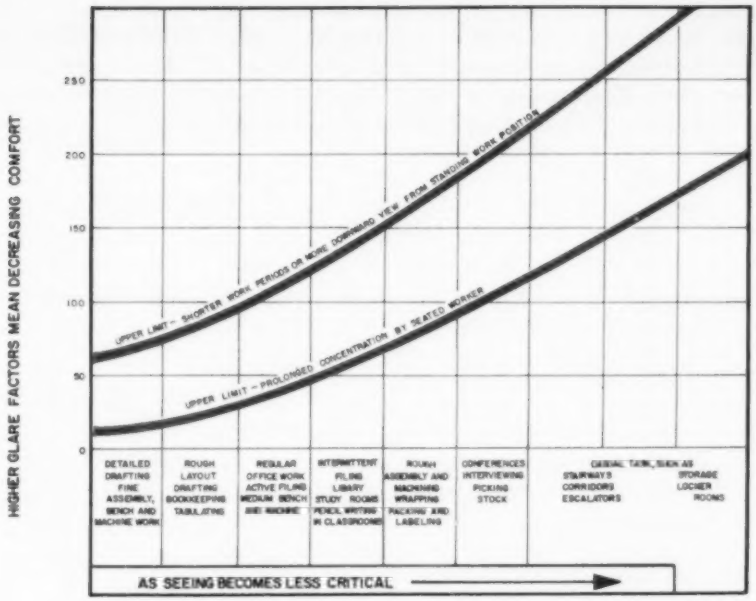
HIGHER GLARE FACTORS MEAN DECREASING COMFORT
250
200
150
100
50
0
UPPER LIMIT – SHORTER WORK PERIODS OR MORE DOWNWARD VIEW FROM STANDING WORK POSITION
UPPER LIMIT – PROLONGED CONCENTRATION BY SEATED WORKER
DETAILED DRAFTING FINE ASSEMBLY, BENCH AND MACHINE WORK
ROUGH LAYOUT DRAFTING BOOKKEEPING TABULATING
REGULAR OFFICE WORK ACTIVE FILING MEDIUM BENCH AND MACHINE
INTERMITTENT FILING LIBRARY STUDY ROOMS PENCIL WRITING IN CLASSROOMS
ROUGH ASSEMBLY AND MACHINING WRAPPING PACKING AND LABELING
CONFERENCES INTERVIEWING PICKING STOCK
GENERAL TASK SEEN AS STAIRWAYS CORRIDORS ESCALATORS STORAGE LOCKER ROOMS
AS SEEING BECOMES LESS CRITICAL

Figure 4. A suggested method for estimating what visual comfort level is appropriate for the task, based on experience in comparing glare factors with actual glare impressions in many interiors.

lighting wattage amounts to some 14 per cent when the two-lamp, 24-inch wide troffer with the indicated shielding element is chosen over the other two recessed systems mentioned. Translated into air-conditioning costs at $1000 per ton,[3] the lower-wattage system would represent a savings of some $200 in cooling equipment investment.

Visual Comfort

No aspect of luminaire selection is more important for office areas than minimizing glare. An installation that merely achieves specified footcandle standards at the sacrifice of lighting comfort is seldom acceptable.[4] Most office work involves long concentration on relatively difficult visual tasks and the overhead lighting system should present a low order of glare, which causes eyestrain, distraction and reduced visibility.

Several direct-glare evaluation systems are available to predetermine the relative comfort of interior lighting installations. The authors have selected the glare factor method,[5] even though considerable mathematical effort is needed to compute the values. The end result, however, comprehends all the luminaire brightness, luminaire size, glare-source position, room size and surround brightness factors known to affect the contribution which any luminaire makes to the total glare effect of an installation. With this method, the lower the glare factor the better the comfort.

Table III shows the initial crosswise and lengthwise glare factors for the luminaires previously mentioned when installed to produce 100 footcandles minimum in service in the 40-by-60-by 10-foot general office with 80-50-30 room surface reflectances. A column is also included for maximum brightness at nadir as an index of the problems likely to be encountered from reflected glare. It will be noted that brightnesses as seen by the worker are in most cases higher than suggested as the objective for best modern practice.[6] The authors do not mean to "wink away" the fact that most popular office-lighting luminaires exceed the recommended practice in this regard, but simply wish to emphasize that the entire industry has a great deal of work to do in evaluating the relative severity of different illumination systems with regard to reflected glare.

The degree of acceptable direct glare, whether specified by glare factors or some other index of visual comfort, should be appropriate for the type of interior and the difficulty of the seeing task. It is believed that two other factors also deserve consideration: (1) worker position (predominant elevation of line of sight); (2) degree of concentration of the worker on the task, and duration of the periods of work.

Fig. 4 shows a graph developed from experience which suggests a "band of appropriate glare factors," depending upon how difficult the task is to see, whether the work is prolonged from a seated position, done for relatively short periods of time from a standing position, and many combinations and degrees of these primary factors.[7] The glare factor requirements are less stringent for standing work positions where the worker looks more nearly downward than does a seated worker. The reason for this is that for a predominant direction of view

nearly downward from a standing position, the number of luminaires in his field of view is less than for seated work positions involving more nearly horizontal directions of view.

The order of importance in lighting offices would seem to us to be somewhat as follows.

(1) Lighting comfort—considering both direct and reflected glare.

(2) Adequate illumination levels for the tasks.

(3) Esthetic considerations—"clean ceiling" architecture.

(4) Economics—with major consideration for total annual cost as against simply initial cost.

(a) Awareness of possible added air-conditioning load.

(b) Consideration of flexibility where office rearrangements are frequent.

One may conclude that the comfort, appearance, and serviceability of the large-element recessed unit may be enjoyed at reasonable cost—with such bonuses as acoustical treatment and simultaneous air distribution also available.

For ceilings higher than ten feet, suspended units of the direct-indirect type may provide the best economy and comfort (direct glare). The suspended ceiling should not be overlooked, as it can fill the architectural as well as the economic requirements, especially in remodeling projects.

Acknowledgments

The authors are indebted to M. M. Buzan for detailed cost analysis on recessed systems and to W. G. Riggs for the voluminous calculations pertaining to coefficients of utilization, brightness and comfort data.

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Our Lady of Good Counsel School

Nine pentagonal classrooms and an administration area grouped around a central core containing a 24-foot diameter rotunda stage and washroom facilities keynote the distinctive architectural plan of the new Our Lady of Good Counsel School, Chicago. Lighting, installed in ceilings which slope from 12 to 9 feet, is from recessed troffers with prismatic lens shielding for low brightness and uniform distribution. Fixtures are mounted on 8-foot centers, in rows which vary from 6 to 18 feet, conforming to the pie-shaped ceiling contour. With warm pastel finishes on all surfaces, maintained lighting level averages 65 footcandles at desk level.

Architects of the school were Kefer & Cronin. Photo and data are courtesy of Sunbeam Lighting Co.

Design Considerations in a
SMALL, MULTI-USE AUDITORIUM

By ALSTON RODGERS, W. D. RIDDLE, R. T. DORSEY

The ease and smoothness with which a variety of presentations are made and the audience reaction are influenced greatly by the character and flexibility of the environment. This includes architectural treatment, method of lighting control and the choice of elements that comprise the space.

This paper discusses features and design considerations applicable to a small auditorium which is appropriate for conference-type meetings, stage demonstrations, skit presentations, illustrated or non-illustrated talks, sound and light demonstrations and other similar presentations. Design elements examined include: factors considered and solutions selected for the auditorium and stage; the necessity for coordination of air conditioning and sound facilites; method of lighting chosen; control of individual elements and their combination for flexibility in providing a variety of suitable environments. Details of the choice of materials, light distributions, colors, levels of brightness and their composition are presented with data where they may serve as a guide for the design of other meeting rooms required to meet similar objectives.

In today's gregarious society, the widespread need for suitable meeting places results in a great demand for small auditoriums and meeting halls, adaptable to a wide variety of uses. Typical of these are school, college, community and "little theatre" auditoriums; meeting rooms rented by hotels, motels, restaurants and other commercial establishments; club, society, fraternal and social organization auditoriums; meeting halls of industrial and commercial concerns; and demonstration spaces created by electric utilities, contractors, distributors and manufacturers.

This paper discusses some of the desirable features and design considerations involved in planning and lighting such a small auditorium with facilities for a variety of kinds of meetings and presentations. The installation (Fig. 1), employing several new types of light sources, materials and equipment, demonstrates a wide variety of techniques and achieves some interesting solutions.

Design for Adaptability

The particular uses of such a meeting area determine its general layout and arrangement. This auditorium, 45 feet long by 34 feet wide, with a ceiling height of 17 feet, accommodates an audience of 175, but must also function suitably for much smaller groups. It is used for general meetings, lectures and training sessions, often involving audience participation, demonstrations, stage presentations and entertainment features. It must also be

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Figure 1. General view of auditorium.

Figure 2. Full-stage presentation with projection screen at left side.

adaptable for conference-type meetings and as a small exhibition hall.

Audience participation and effectiveness with smaller groups dictates an informal relationship between seating and presentation areas. Here this was achieved principally by using only a 15-inch high stage platform, with one broad step leading from the auditorium floor, and a wall-to-wall main curtain, giving the effect of a draped wall rather than a stage proscenium.

Since the low platform provides good visibility from only four or five rows of seats on a level floor, the rear portion of the seating area is ramped upward. Permanent, theatre-type seats, finished in olive-green and upholstered in dull green-gold, are used in the ramped area.

On the level floor at the front, comfortable aluminum-frame chairs, alternately with and without arm rests, present the appearance of a theatre seating arrangement. Upholstered in brighter old-gold and soft yellow tones, these give the front seating area a particularly inviting look, which helps considerably in bringing smaller groups close to the stage. The seats may be arranged in informal groupings when desired. For a conference arrangement, chairs without arm rests can be removed and the armchairs set around a large table or groups of tables. On other occasions, the front area and stage can be cleared for exhibits and displays.

Since the stage is used primarily for demonstrations, a depth of eight feet behind the main curtain proves sufficient. If the stage were to be suitable for dramatic presentations, it should be much deeper to accommodate practical stage settings.

To increase adaptability and achieve a less formal appearance, the stage itself is moved off-center to the right and a large architectural element, in the form of a luminous grillework screen, placed at the left. This arrangement also provides a large, off-stage working space behind the screen, that aids greatly in stage operation.

The mobile-color screen becomes a focal point for creating a myriad of different visual moods and environments. In conjunction with stage demonstrations and talks, it can be converted instantly into a side-stage projection screen, by raising sections of the grillework to expose an eight- by eight-foot section of the flat white diffusing material behind (Fig. 2).

Flexibility of Environment

The ease and smoothness with which a variety of presentations are made and the reception of an audience are influenced largely by the character and flexibility of the environment. This includes the architectural and lighting treatment and the choice of elements that make up the space. Since a flexible lighting system offers the most practical means of achieving changes in visual environment, separate lighting systems accent the ceiling, side walls, seating area and front curtain, in this auditorium.

Figure 3. View from stage. Flexible electroluminescent lamps illuminate exit signs and clock face when the auditorium is darkened.

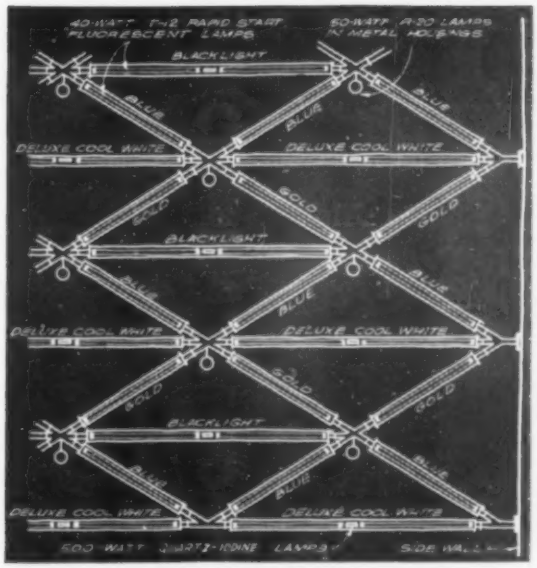


Figure 4. Partial plan of lamp arrangement in space frame, with a total of 42 cool white deluxe, 36 gold, 36 blue and 24 blacklight blue glass bulb fluorescent lamps; 33, 500-watt quartz-iodine incandescent lamps and 30, 50-watt R-20 downlights.

Light, neutral tones were selected for these surfaces, for best reflection of all colors of light. The fabric chosen for the front curtain has a small, unobtrusive pattern of light browns, old-gold and white, compatible with the colors of the auditorium seats. The side wall panels are covered with heavily textured, plasticized fabric in tones of warm white and light brown. The ceiling is of white acoustic tile, for good sound-conditioning.

General Lighting System

One of the objectives in this auditorium is to intrigue architects, engineers and designers with the unusual possibilities afforded by modern light sources, materials and equipment. Consequently, the designers decided to explore the effects of applying some of the modern structural techniques, such as the "geodesic dome" and the "space frame," to the architectural and lighting treatment of such an area as this.

The result was the interesting "space frame" general lighting structure (Fig. 3). In effect, this is a large lighting unit, composed of a self-supporting network of specially-designed wiring channels, spanning the room from wall to wall, supporting indirect-lighting troughs containing lamps and ballasts, arranged as shown in Fig. 4. The quartz-iodine lamp circuit alone produces an average horizontal illumination of 50 footcandles. This indicates a coefficient of utilization of .22 for the system, in this space. The simple downlighting system of small reflector lamps, shielded to 60 degrees in black aluminum cylinders, can provide about five footcandles during picture or stage presentations. No light spills on walls, ceiling or projection screens.

The ceiling is painted with a highly reflective white fluorescent pigment that glows a deep blue when activated by "black light." A sprinkling of white fluorescent star shapes across the ceiling completes the "black light" effect of a starry night.

Lighting and Air Conditioning Integrated

Conditioned air is introduced through air diffusers in the side walls below the level of the lamps

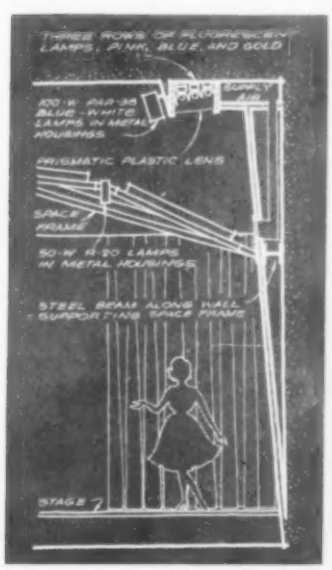

THREE ROWS OF FLUORESCENT LAMPS, PINK, BLUE, AND GOLD
SUPPLY AIR
100-W R40-38 BLUE-WHITE LAMPS IN METAL HOUSINGS
PRISMATIC PLASTIC LENS
SPACE FRAME
50-W R-20 LAMPS IN METAL HOUSINGS
STEEL BEAM ALONG WALL SUPPORTING SPACE FRAME
STAGE

Figure 5 (left). Section through side wall. Figure 6 (right). Light control characteristics of clear prismatic plastic panels used in soffit lights.

and lighting troughs (Fig. 5). Air is exhausted from the room through grilles in the ceiling above the lighting equipment. This results in effective removal of most of the lighting heat before it can enter the occupied space. In winter, a portion of this heated air is returned to the system, resulting in lower heating costs.

To conceal the air-conditioning ducts and structural steel beams without sacrificing precious floor space, the side walls were sloped as shown. One amusing result is the optical illusion that the entrance doors are not hanging plumb.

Wall Lighting

Continuous soffit panels, running the length of the room, light the side walls in a variety of colors. The "low-brightness" prismatic plastic panels control and concentrate the light rays (Fig. 6), reducing apparent brightness and distributing light smoothly far down the walls. With all three rows of lamps lighted, brightness of the upper walls is 20 fL, graduating down to 3 fL at audience eye-level.

For an interesting decorative effect, baffled downlights are positioned at regular intervals to cast shadows of the space frame on the walls. Above the doorway, in the center of each sidewall, a recessed soffit light with a 40-watt warm white deluxe fluorescent lamp above prismatic plastic accents the brightly colored entrance doors.

Choice of Illumination Levels

The graphs in Fig. 7 show how circuits may be added together to produce illumination values through a range of 10 footcandles for social activities, 18 footcandles for auditorium assembly, 30 footcandles for exhibitions, and 80 footcandles for class work, all equalling or exceeding current IES minimum recommendations. For a conference arrangement, the white fluorescent and incandescent circuits over the rear half of the room can be switched off, concentrating attention on the conference area at the front.

Color-Lighted Curtain

Even though the curtain track is mounted only 12 inches behind the proscenium panel, a simple and relatively low-cost means was devised to light the curtain effectively. A "concert border," consisting of wiring channel with PAR-38 colored floodlamps on six-inch centers is mounted on the back of the proscenium panel. The back of this panel is surfaced with a sheet of specular Alzak aluminum. This acts as a mirror, reflecting the image of the lamps and giving the effect of another row of lights ahead of the proscenium (Fig. 8). Use of the mirror increases illumination at the top and bottom of the curtain, in the order of 30 to 40 per cent, and doubles values toward the center.

For an interesting and additional effect, two 200-watt PAR-46 narrow-beam spotlights are mounted at the ends of the "concert border" and aimed diagonally across the curtain to graze its folds with shafts of light.

Mobile-Color Screen

This is a shallow light-box only 12 inches deep, covered with a sheet of pliable plastic "matte white velvet" projection screen material 8 feet wide by 14 feet high, stretched and buttoned onto the box with snap fasteners. This material has a reflectance of about 75 per cent and 8 per cent transmittance. Less than one per cent of the light from a projected picture is reflected back through it from the light box, so picture contrast is not diminished.

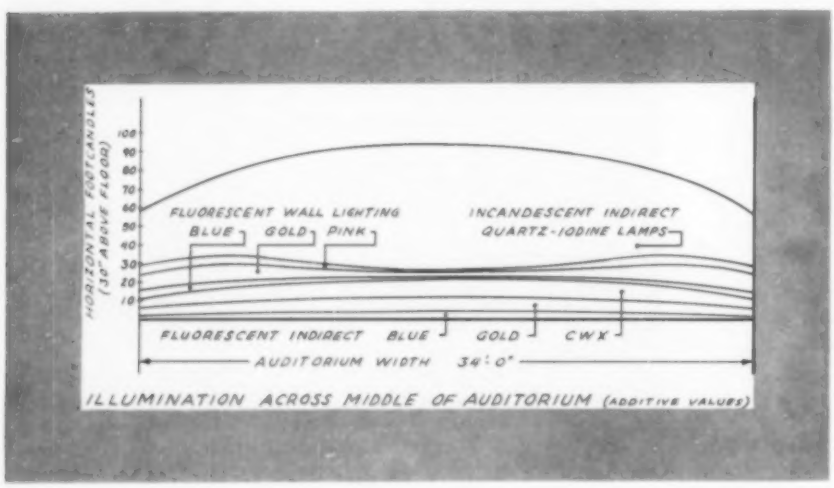


Figure 7. Illumination distribution across auditorium.

To use this screen as a luminous element, four circuits of 40-watt rapid-start fluorescent lamps are mounted horizontally one above the other nine inches back of the screen, with lamps on each circuit spaced 13½ inches apart for uniform illumination. Even with a diffusing medium of such low transmittance, surface brightnesses are quite satisfactory. Maximum screen birghtness measured for the four circuit colors are: green, 50 fF; gold, 30 fL; pink and blue, 20 fL.

For the grillework overlay, a white molded-plastic circular-patterned louverall ceiling mate-

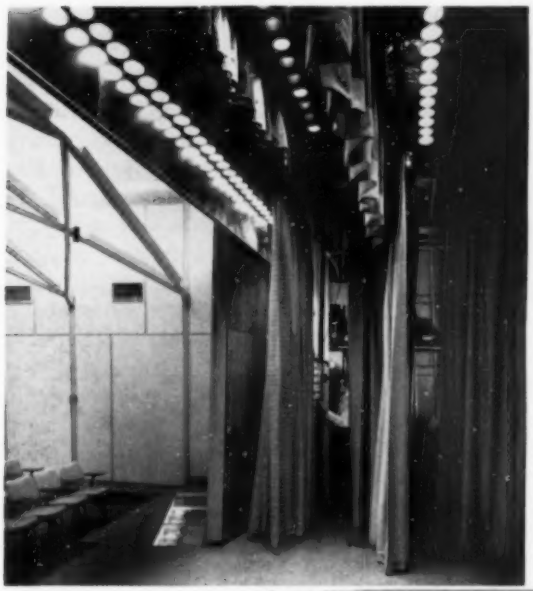
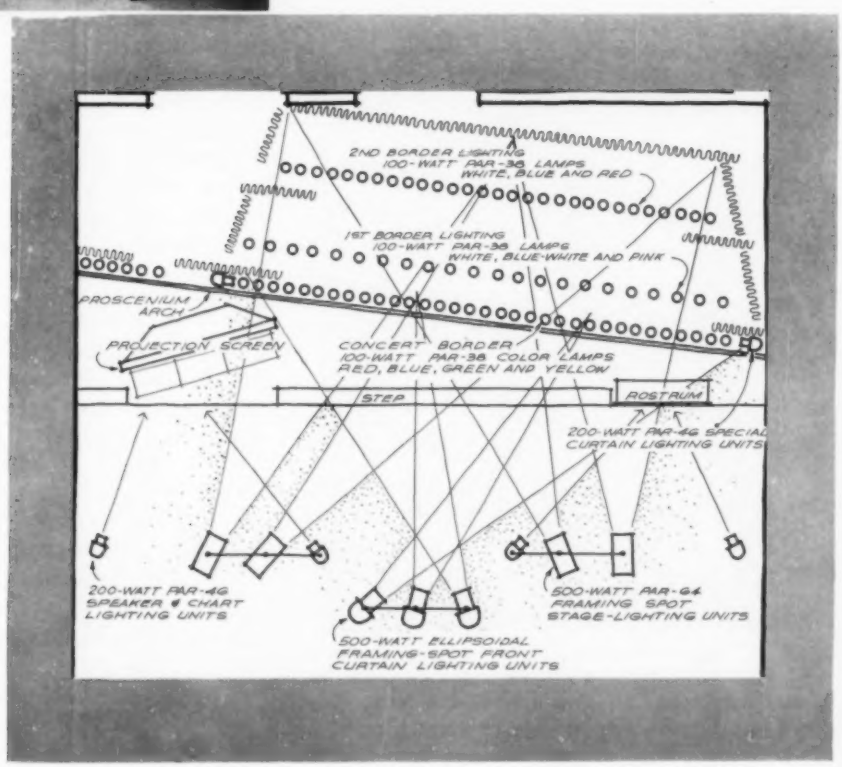


Figure 8 (left). Stage and curtain lighting equipment and stage switchboard. Note reflection of concert border in mirror panel, which gives the appearance of a double row of lamps.

Figure 9 (below). Stage lighting arrangement.



rial is used. A pleasing two-tone color effect is obtained by lighting the grille in one color from behind, with another color projected at a grazing angle from footlights in front. The footlights consist of a bank of 18 projector and reflector lamps on four color circuits, set in a stage pocket covered with plates of ½-inch clear tempered glass.

Effective Presentation

Particualrly in a multi-use auditorium, close attention to even the smallest details of provisions for ease of operation, speakers' requirements, staging, lighting and sound control are necessary for smooth, effective presentations.

Stage Lighting

Arrangement of the stage lighting for this auditorium is shown in Fig. 9. In addition to overhead light from the borders, four framing spotlights, of a type using PAR-64 projector lamps, are suspended from the auditorium ceiling to provide light from in front of the stage. These are aimed to cross-light the stage, providing light from two directions at all points to minimize shadows. The framing shutters are adjusted to eliminate spill light on the proscenium.

Three separately-controlled ellipsoidal framing spots light the main curtain and stage apron in three overlapping sections, right, center and left.

Figure 10. Speakers' rostrum. The scratch pad swings out from a decorative wall panel and is lighted by two 15-watt fluorescent lamps in a vertical reflector concealed in the panel. The pad can be pulled downward for convenience in writing.

A speaker in any of these areas may be properly lighted without spilling light on an adjacent projection screen.

On the stage, six floor-outlet circuits, available in each of four stage pockets, together with outlets in the face of the stage platform provide for connecting demonstrations and other electrical equipment. Wired battens are suspended overhead to accommodate hanging luminaires, set pieces and stage decorations.

Speakers' Requirements

Spotlighting for the speaker at the rostrum requires careful planning. A good rule-of-thumb is to use two spotlights aimed downward at 45 degrees and from 45 degrees each side of the speaker's line of sight to the center of the audience. Here the two 200-watt PAR-46 narrow-beam spotlights, mounted as described above at a distance of about 20 feet, can light the speaker's face to 150 footcandles, but are dimmed to a lower value except when the room is fully illuminated, as illustrated in Fig. 10.

Instead of the usual pulpit-like speakers' stand, this rostrum is designed with the more informal appearance of a modern aluminum and wood table, with plenty of room for papers and notes, hand props, glasses and water carafe. The lectern for the speaker's script can be be adjusted in height by turning a knob. It is lighted by three 25-watt T-10 reflector showcase lamps, dimmer-controlled by the speaker. Also included are a built-in clock, switched convenience outlets and a push-button lantern slide signal on cord and reel. The public address system microphone is at the left and a lavaliere microphone and cord are also provided. Wiring connections are fed through a slotted track in the floor, so that the rostrum can be moved to the wall when it might obstruct the audience's view of the stage.

Picture Projection

For center-stage showing of slides and movies, a 20-foot motor-driven roller projection screen is mounted immediately back of the main curtain, which can be opened to three pre-set positions, 8 feet for pictures of standard proportion, 16 feet for wide-screen pictures and 20 feet for full-stage opening. Two loud speakers, close to the ceiling on each side of the stage provide for either monaural or stereophonic sound.

The semi-enclosed projection booth (Fig. 11) has facilities for 16-mm movies, sound-slide films, standard 3¼- by 4-inch slides and 2- by 2-inch slides. Projectors are swiveled to pre-set positions for side or center screen. The public address system controls also are located here. Loudspeakers

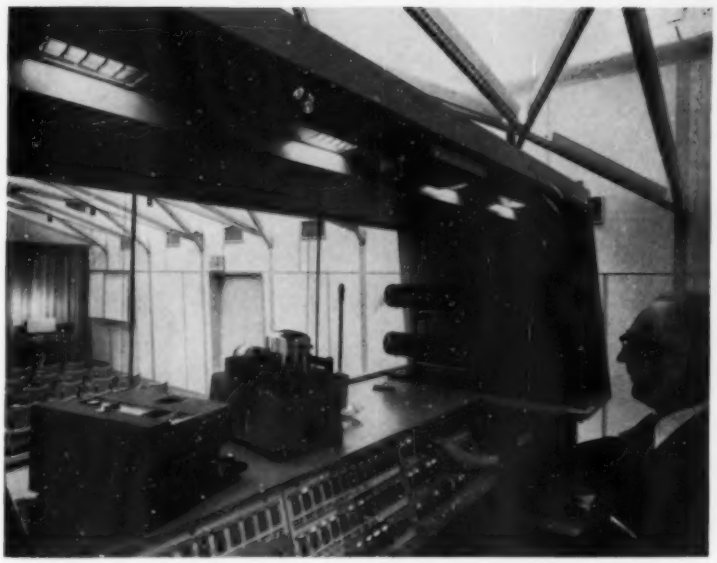


Figure 11. Projection booth and control console. Booth lights are small reflector showcase lamps installed above miniature louvered window screening.

for this system are above six of the grilles in the auditorium ceiling. A sound reproducion cabinet, with record turntable and magnetic tape machine, are at the operator's right.

Control System

Two duplicate control centers, one backstage and one in the projection booth, permit effective operation with minimum manpower. To enable use of both switchboards at all times, switch-operated motor-driven variable transformers, on a six-second cycle, are used on all dimming circuits. This equipment, together with the bank of circuit-control relays, is located in a room behind and above the stage. While this system would present serious drawbacks for dramatic presentations because of the inflexible rate of dimming, it suits the requirements of meetings very well, since other remote dimming arrangements permit control from only one location at a time.

All the 40-watt fluorescent lamps in the auditorium are equipped with wide-range dimming ballasts, operating on a pulsing-transformer principle, controlled by the variable-voltage dimmers. These make a dimming range of 300 to 1 possible. The particular ballasts used provide a maximum of only 80 per cent of rated lamp lumens. Necessary current information should be obtained from the ballast manufacturer before calculating the lighting design.

All circuits are operated by a standard low-voltage remote control wiring system with light-touch switches having special neon indicator lights added. They are arranged in easily recognized groups controlled by nine group-master switches. At present, 74 circuits are being used, 39 of the circuits on dimmers.

Color-Music

The very flexible lighting and control features of this auditorium have inspired the development and presentation of color-music programs, that seem pleasing to the audiences. Although certainly not a new idea, this installation affords the opportunity of using the whole room as a color-organ, with the color-lighted curtain and mobile-color screen as principal performers, and a changing aura of light and color keyed to the music surrounding the entire audience. Many such installations have designed devices to control color and intensity of light from the sound frequencies and volume of music. However, we believe more pleasing results are obtained by planning a "lighting score" of appropriate color combinations and variations, operated exactly "on cue" with the musical selection. A "lighting score" creates an individual performance rather than an interesting display of colored lights. The operator truly "plays the light."

Conclusion

While few small auditoriums could be expected to use or need all of the lighting and design features incorporated in this installation, every auditorium needs some of them. The authors hope that some of the design principles, ideas and solutions, expressed in this paper, will give helpful hints to others faced with similar problems.

Presentation of the Gold Medal Award was an impressive segment of the Opening Session. President Richard G. Slauer, at left, is presenting medal to Dr. Deane B. Judd, center. At right is Albert F. Wakefield, chairman of Medal Award Committee.

ALC winners center, holding replicas of the Goddard trophy, are Carl R. Johnson, Northeastern Region, and Elizabeth A. Meehan, East Central Region. President Richard G. Slauer displays the permanent Goddard trophy on which names of yearly winners are inscribed.

CONFERENCE AWARDS AND HONORS

Fellows receiving their white lapel pin at this conference, l. to r.: A. A. Eastman, G. E. Davidson, G. E. Inman, H. A. Kliegl, D. B. Judd (Medalist, not a Fellow), H. E. D'Andrade, A. W. Weeks, M. E. Keck, and K. A. Staley.

Travel Award—gavel and anvil for members present per miles traveled accepted from President Slauer by C. E. O'Daniel, chairman of winning Capital Section.

President's pin to outgoing President R. G. Slauer, left, presented by incoming President, J. R. Chambers.

LIGHTING NEWS

IES National Technical Conference–1961

Over the years various IES conference committees have evolved a formula which now is almost sure-fire—given the circumstances of weather and locale. Its most successful parts: technical sessions of maximum significance; traditional events special to IES members; a social program geared to the varying interests (and ages) of delegates; enthusiastic local interest (and work). At the St. Louis Conference, these parts were in good balance, with a local talent for fellowship as an added ingredient.

Corporate Meeting

This is the newest "tradition" for national conferences. In prior years the Society's annual meeting—required by the By-laws—was a perfunctory affair held in New York City with few, if any, members present. Since 1958 it has been a part of the opening session of the national conference, with such success that this procedure is now an established tradition. This meeting is now, in truth, as it was intended, an open forum meeting of officers and members, with discussion and questions from the floor. Questions at the meeting this year initiated an interesting discussion of the Research Institute, especially in regard to where and what information is available on it. (Answer: Newsletter from C. L. Crouch, IES Headquarters; IERI Annual Report, July 1961 IE; Research Session at this conference). Another open discussion was on technical committee reports and their timing. (See Report of the President-Elect published in September 1961 IE.)

With President Slauer presiding, the corporate meeting also included individual reports of the past year's work by the President, General Secretary, and President-Elect. Such reports are designated as Transactions of the Society and are recorded in full in IE. (President and Vice-President's Reports in September 1961 IE; General Secretary's Report, December IE; the latter to include all membership and financial statistics.)

Highest Society Awards

Several pleasant ceremonies are traditionally a part of the opening session of an IES National Technical Conference. Most impressive of these, and indeed, most significant of any lighting award in this hemisphere, is the Award of the IES Gold Medal and Certificate—for meritorious achievements in the art and science of illumination. It was President Slauer's pleasant duty at this session to present this highest honor to Dr. Deane B. Judd, the country's most outstanding authority on colorimetry (see August 1961 IE, p. 9A). Dr. Judd's acceptance address appears on page 19A.

Also traditionally honored at this session are newly elected Fellows of the Society. At St. Louis, eight new Fellows were presented with their white lapel

CONFERENCE VIP's—C. L. Amick, chairman National Conference Committee 1960-61, President R. G. Slauer, 1961-62 President J. R. Chambers, and Brooks Chassaing, St. Louis Conference Chairman.

Conference Statistics

Date:	September 25-28, 1961
Place:	Chase-Park Plaza Hotel, St. Louis, Mo.
Chairman:	Brooks Chassaing

ATTENDANCE

Delegates:	589
Ladies:	135
Total:	724
Banquet:	708
Attendance Award Winner:	Capital Section

Conference Attendance Past Ten Years

1952	Chicago, Ill.	859
1953	New York, N. Y.	1007
1954	Atlantic City, N. J.	857
1955	Cleveland, Ohio	754
1956	Boston, Mass.	960
1957	Atlanta, Ga.	926
1958	Toronto, Ont.	970
1959	San Francisco, Calif.	844
1960	Pittsburgh, Pa.	776
1961	St. Louis, Mo.	724

pins, denoting their election to this highest grade of IES membership:

H. E. D'Andrade — Merle E. Keck
Grant E. Davidson — Herbert A. Kliegl
Arthur A. Eastman — Karl A. Staley
George E. Inman — Arthur W. Weeks

Technical Sessions

Sinew and bone of all national IES conferences are the featured technical sessions. This year's program presented 34 papers and their discussions, details of which are recorded on page 000. Abstracts of all these papers were published in the September issue of IE. No abstract, nor perhaps the published papers either, could do justice to several unusually interesting presentations. One of these unquestionably was the invited paper by J. M. Waldram, Central Research Laboratories of General Electric Company, Ltd., Wembley, England. This demonstrated, via motion pictures, a unique method of study of visual problems of automobile drivers. The paper is scheduled for publication in March IE, and should provide a refreshing new approach to investigations of many areas of seeing and lighting needs, as well as roadway conditions.

Another rewarding session was the "Report Session" of the Illuminating Engineering Research Institute held on Monday afternoon. Three noted researchers for IERI reported developments on three current research projects.

Not officially a part of the papers program, but nevertheless a valuable part of the conference was the session sponsored by the Residence Lighting Forum national committee. This featured three addresses of wide interest to all lighting practitioners.

As the published record (at end of this report) indicates, the papers program at the St. Louis conference offered an interesting balance of technical developments in illumination, and application techniques in lighting practice.

Applied Lighting Competition

For the many practical application engineers, architects and consultants attending the conference, the program highlight is the national finals of the Applied Lighting Competition. At St. Louis all 12 Regions were represented in both Residential (Class I) and Commercial (Class II). The competitions for each class were run in parallel sessions (a practice which may change next year, most fans of this event will be pleased to learn.) First and second prize winning installations for each class are published in this issue of IE, starting on page 627. Details of the other entries, all of them prize winners in previous contests, will appear in subsequent issues.

First prize winners in each class were presented with cash awards ($100 each) and silver replicas of the Goddard trophy, engraved with their names.

Judges in the contest decided the results as follows:

CLASS I—RESIDENTIAL

Judges: Virginia Skinner, Dorothy Davis, Roy Kreyser.

First Prize: Elizabeth A. Meehan, Philadelphia Section, East Central Region.

Second Prize: May Love Gale, Tennessee Valley Section, South Central Region.

Third Prize: Peter R. Darnton, San Jose Chapter, South Pacific Coast Region.

Fourth Prize: Tie between Hazel Harbauer, Northwestern Ohio Section, Great Lakes Region, and Grace Schoeni, Oregon Section, Pacific Northwest Region.

CLASS II—COMMERCIAL

Judges: Carman Miller, John M. Chorlton, J. D. Whitnell.

First Prize: Carl R. Johnson, New Jersey Section, Northeastern Region.

Second Prize: Melvin Cohen and Leo Chicca (joint entry) Chicago Section, North Central Region.

Third Prize: Fred L. Lantz, Michigan Section, Great Lakes Region.

Fourth Prize: Harold Stead, Arizona Section, Inter-Mountain Region.

Special Events

IES conferences, it seems, have something for everyone. For some the tech-

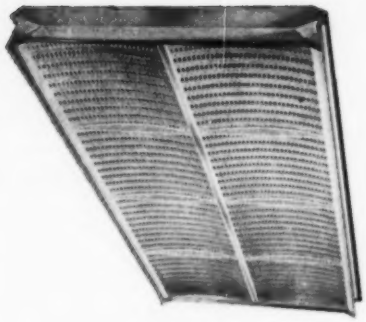
(Continued on page 12A)

(above) PROGRESS REPORT was again this year s.r.o., and one of the most popular features all week. Max K. Strang of Toronto, at podium, was chairman. Assisting him is one of his several "space-men."

(above right) SPECIAL WINDOW display featured in St. Louis during IES Conference is viewed by, l. to r.: J. R. Chambers, C. L. Amick, H. J. Poehling, and C. C. Lewis.

(right) REVIEWING THE Allied Arts entries display in St. Louis are, l. to r.: Emmet Layton, Carl Albach, Ed Rambusch, Bob Brown and Eugene Mackey.

ONE CONCEPT FIFTEEN CHANGES



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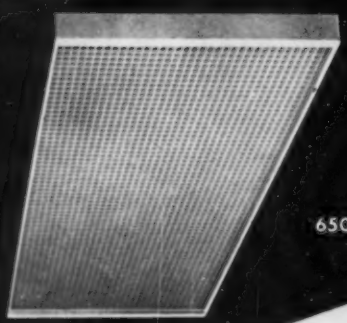

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(*Continued from page* 10A)

nical program is the highlight; for others the personal contacts. For many, there is special value in the numerous tours, committee meetings, and special luncheons. Three of these luncheon sessions were a big feature at St. Louis.

Sponsored by the Sustaining Membership Committee, George J. Taylor chairman, a special luncheon was held on Monday afternoon to honor the Sustaining Members of IES. Some 150 representatives of S-M companies attended this special session. Guest speaker was Harold A. Webster, President of the National Electrical Contractors Association. His excellent address "Lighting Moves into High Gear" is being reproduced and a copy will be sent to all Sustaining Members.

The Residence Lighting Forum also sponsored a luncheon session, on Tuesday afternoon. This was attended by some 100 delegates and mc'd by Aileen M. Page, chairman of the national Residence Lighting Forums Committee.

One of the oldest of all conference traditions is the Past-President's Luncheon. What goes on at this event is private, known only to this select group of members. Attending this special luncheon in St. Louis on September 26 were Past-Presidents: J. B. Browder, Dr. George S. Crampton, Ward Harrison, Kirk M. Reid, R. G. Slauer, Everett M. Strong, Lee E. Taylor, George J. Taylor, A. F. Wakefield; and incoming member, James R. Chambers.

Tours of outstanding interior and street lighting installations, arranged by hard-working St. Louis committees, were available for every evening of the conference week. Between sessions and tours, committee meetings were humming throughout the hotel all week, certainly at every breakfast period. Many of these were preparing for final report to the Council meeting which was held in St. Louis on September 29, following adjournment of the conference.

Social Program

Both aspects of the social program—for ladies only and for all concerned—were hits in St. Louis. All concerned started things going even before the conference started, with a "Heidelberg Party" on Sunday evening. This was in just the right locale for such an event—the glass-enclosed roof of the Chase Hotel, with the stars above and the St. Louis skyline below. As the name suggests, the atmosphere reflected St. Louis' German forebearers, complete with souvenir glazed ceramic beer steins.

Also great fun was the en masse trip Monday evening to St. Louis' interesting Gaslight Square. Enterprising proprietors of night spots in this area have turned their entire square into a nostalgic replica of the gay nineties, give or take twenty years. Chartered buses leaving every fifteen minutes, both ways, were on hand to accommodate the IES parties to this gay locale.

Attendance at the Wednesday evening banquet-dance, in honor of President and Mrs. Slauer, exceeded that of all but one previous conference banquet. There were two reasons for this. One, it was an exceptionally good party, in an enormous ballroom with especially good menu and music. Second, it was

held in the middle of the conference week, rather than as the finale.

Before this brilliant assembly, was held the annual ceremony of inauguration of the new President, and honoring of the retiring one. Here the gavel was passed to incoming President James R. Chambers, who in turn pinned to the lapel of Richard G. Slauer the honored diamond-studded Past-President's pin. President and Mrs. Slauer also received, as a memento of their presidential year, a beautiful Steuben glass bowl.

For ladies only there was a complete program, all planned and directed by a large committee of St. Louis women headed by Mrs. Norman L. Krause as Ladies Advisory Committee chairman. These daily programs started each morning with continental breakfast together in a suite set aside for their use. From this comfortable start they participated in tours and parties which included the Botanical Gardens and famous Climatron, Grant's Farm, St. Louis Cathedral, the river front and Showboat, famous breweries, shopping expeditions and numerous unscheduled parties. Special luncheons were featured every day, each at some famous and interesting St. Louis spot.

Credit Due

For the record, credit is due the following St. Louis members for their successful planning and execution of the 1961 National Technical Conference:

Conference Executive Committee
Chairman, Brooks Chassaing
Publicity—H. J. Poehling
Printed Publicity—Lou Rozier
Finance—C. Carter Lewis

(*Continued on page* 16A)

HEAD TABLE at Conference Banquet. In foreground is special table reserved for Past-Presidents and their wives.

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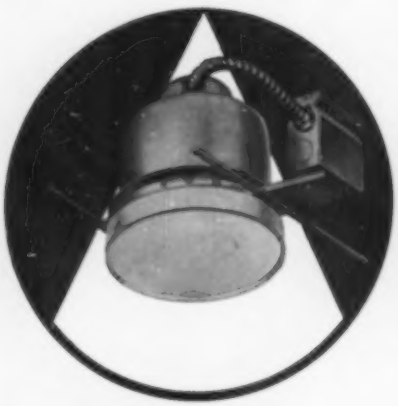

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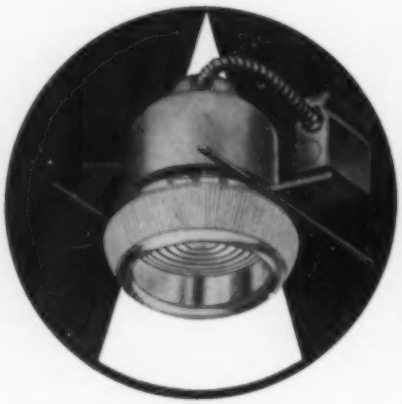
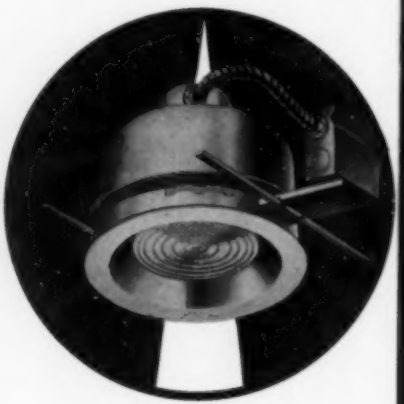


CLAREMONT



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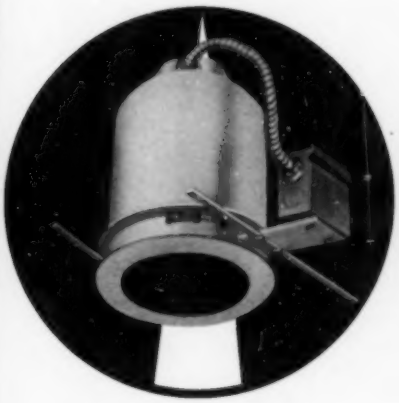

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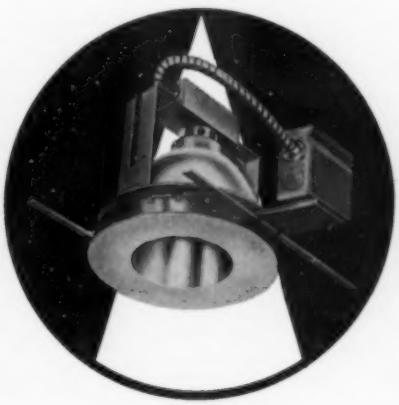

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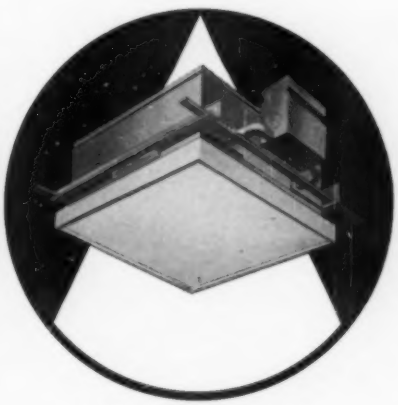

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Toledo:
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Youngstown:
The Braff Ltg. Fix. Co.

OKLAHOMA
Oklahoma City:
Elec. Sup. of Oklahoma
Hunzicker Bros.

OREGON
Portland:
Baker-Barkon Co.
Malloy Robinson Co.

PENNSYLVANIA
Allentown:
Coleman Elec. Co.
Erie:
Kraus Elec. Co.
Harrisburg:
Fluorescent Sup. Co.
Schandler Bros.
Hazleton:
Power Elec. Co. Inc.
Lancaster:
Jno. E. Graybill & Co.
New Castle:
Midwestern Elec. Co.
Norristown:
Norristown Elec. Sup. Co.
Philadelphia:
Gold Seal Elec. Sup. Co.
Logan Elec. Sup. Co., Inc.
Pyramid Elec. Sup. Co., Inc.
Silver's Elec. Sup. Co.
Sylvan Elec. Fix. Co.
West Phila. Elec. Sup. Co.
Pittsburgh:
Allied Elec. Sup. Co.
Argo Life Studios
Brown & Green
Wally Elec. Sup. Co.
Reading:
Coleman Elec. Co.
Scranton:
Lewis & Reif, Inc.
Uniontown:
Pioneer Electric Dist.
West Chester:
West Chester Elec. Sup. Co.
Wilkes-Barre:
Anthracite Elec.
Williamsport
Lowry Electric Co.
York:
Jno. E. Graybill & Co.

RHODE ISLAND
Pawtucket:
Major Elec. Sup. Co.
Providence:
Leavitt Corson Co.
Tops Elec. Sup. Co.

SOUTH CAROLINA
Columbia:
Capital Elec. Sup.
Noland Co.
Greenville:
Sullivan Hdwe. Co.

SOUTH DAKOTA
Watertown:
J. H. Larson Elec. Co.

TENNESSEE
Chattanooga:
Mills & Lupton Sup. Co.
Noland Co.
Knoxville:
The Kenner Co.
Memphis:
Belvedere Lighting Co.
Nashville:
Nashville Elec. Sup. Co.

TEXAS
Brownsville:
Electric Fix. Sup. Co.
Dallas:
Rogers Elec. Sup. Co.
Ft. Worth:
Anderson Fixture Co.
Cummins Supply Co.
General Industrial Sup. Corp.
Houston:
Anderson Light[illegible] Co.
Gulf Coast Elec. Sup. Co. Inc.
Martin Associates
Worth Elec. Sup. Co.
San Antonio:
Electrical Distrib. Co.
Southern Equip. Co.
Strauss-Frank Co.
Worth Elec. Sup. Co.
Waco:
Dealers Elec. Sup. Co.

UTAH
Salt Lake City:
Artistic Lighting

VIRGINIA
Arlington:
Dominion Elec. Sup. Co. Inc.
Noland Co.
Lynchburg:
Mid-State Elec. Sup. Co. Inc.
Roanoke:
Noland Co.

WEST VIRGINIA
Charleston:
Capitol Light Co.
Goldfarb Elec. Sup. Co.

WISCONSIN
Appleton:
Moe Northern Co.
Eau Claire:
W. H. Hobbs Supply Co.
La Crosse:
W. A. Roosevelt Co.
Milwaukee:
Electri-Craft Lighting
Lappin Electric Co.
Standard Elec. Sup. Co.
Racine:
Milch Elec. Sup. Co.

WASHINGTON
Seattle:
Seattle Lighting Fix. Co.

CANADA
Edmonton:
Alberta Elec. Sup. Ltd.
Montreal:
L. D. G. Products, Inc.
Gray Elec. Co.
Union Elec. Sup. Co. Ltd.
Toronto:
Revere Elec. Dist.
Toronto Ltg. Section
Union Elec. Sup.

(left) SUSTAINING MEMBER Luncheon. Harold A. Webster, president of the National Electrical Contractors Association, was guest speaker before 150 SM guests. (right) PAST-PRESIDENTS' Luncheon, a conference tradition. Seated, l. to r.: Dr. George Crompton, Lee Taylor, Ward Harrison, Willard Brown, Everett Strong. Standing l. to r.: incoming members John Chambers, Kirk Reid, J. B. Browder, George Taylor, Richard Slauer.

(Continued from page 13A)

Hotel—Richard D. Cohen, Chairman; Ron Mitchellette, Vice-Chairman; with N. L. Krause, E. G. Jerrald and Henry C. Mannie.

Registration-Reception—Frank C. Cline, Chairman; Fred E. Guth, Vice-Chairman; with Joe Chassaing.

Entertainment—E. W. Stohlmann, Chairman; Paul Q. Oischner, Vice Chairman; with Beverly Bunn and James F. Feisley.

Ladies Committee—Edwin H. Bauth, Chairman; Hayward L. Gray, Vice-Chairman.

Conference Sessions — 1961

September 25

Presiding—Charles L. Amick, Chairman, National Technical Conference Committee.
Invocation—Most Reverend Glennon P. Flavin, Auxiliary Bishop of the Archdiocese of St. Louis.

Corporate Meeting

National Officers Reports
President—Richard G. Slauer
General Secretary—J. Dixon Mitchell
President-Elect—James R. Chambers
Introduction of Fellows
Presentation of IES Gold Medal to Deane B. Judd, by A. F. Wakefield, Chairman, Medal Award Committee, and President R. G. Slauer.

IERI Report Session

Presiding—C. L. Crouch, Technical Director, IES.
Development of Visual Task Evaluators for Use in Specifying Recommended Illumination Levels—H. Richard Blackwell, Ohio State University.
Visibility Loss Caused by Brightness Difference in Space and Time— R. M. Boynton, University of Rochester.
Glare from Large Area Sources—R. G. Hopkinson, Building Research Station, Garston, England.

September 26

Light Sources I

Chairman—J. L. Cox, Duro-Test Corp., North Bergen, N.J.
Discussion Organizer—D. E. Dunne, Smithcraft Corp., Chelsea, Mass.
Design and Application of Panel Type Fluorescent Lamps—C. M. Cutler and W. C. Martyny, General Electric Co., Cleveland, Ohio.
Operating Characteristics, Environmental Testing, and Circuit Applications of Plastic Electroluminescent Lamps—J. C. Devol, General Electric Co., Cleveland, Ohio.
Fluorescent Lamps of Helicoidal Configuration —Luke Thorington and Joel Shurgan, Duro-Test Corp., North Bergen, N.J.

Applications I

Chairman—J. S. Hamel, Hamel Engineering Inc., Burbank, Calif.
Discussion Organizer—E. H. Church, Lighting Products Inc., Highland Park, Ill.
Stroboscopic Effect of Mercury Lamps with Various Ballasts and Circuits— G. A. Horton and W. S. Till, Westinghouse Electric Corp., Cleveland, Ohio and Bloomfield, N.J., respectively.
Ballast Thermal Protection—D. Lovinger, General Electric Co., Danville, Ill.
Convective Transfer of Lighting Heat Loads—M. L. Quin and R. D. Bradley, Day-Brite Lighting Inc., St. Louis, Mo.

Light Sources II

Chairman—T. C. Sargent, Sylvania Electric Products Inc., Salem, Mass.
Discussion Organizer—A. W. Weeks, Champion Lamps Work, Lynn, Mass.
Modified Current Waveshape and Starting Voltage Limits for Mercury Lamps—R. J. Smith and W. C. Matz, General Electric Co., Cleveland, Ohio.
Improvements in Deluxe Fluorescent Lamp Colors with New Phosphors—M. A. Chernin, General Electric Co., Cleveland, Ohio.
Characteristics of Ribbon Filament Lamps—L. G. Leighton, General Electric Co., Cleveland, Ohio.
Xenon High Pressure Lamps, New Designs Demonstrate Their Versatility—W. E. Thouret and H. S. Strauss, Duro-Test Corp., North Bergen, N.J.
New Compact Arc Lamps of High Power and High Brightness—Otto E. Lienhard and John McInally, Englehard Hanovia Inc., Newark, N.J.
Thermionic Emission of Fluorescent Lamp Cathodes—C. L. Toomey and J. F. Waymouth, Sylvania Electric Products Inc., Danvers, Mass.

Research I

Chairman—F. W. Sell, Detroit Edison Co., Detroit, Mich.
Discussion Organizer—K. Franck, Holophane Co., Inc., Newark, Ohio.
A General Method of Computing Reflected Glare and Evaluating its Visual Significance —H. R. Blackwell, Ohio State University, Columbus, Ohio.
Street Lighting and Accidents—J. M. Waldram, General Electric Co., Ltd., Wembley, England.

Evening Session

Progress Report—Chairman, M. K. Strang, Curtis-Allbrite of Canada, Ltd., Toronto, Ont.

September 27

Applied Lighting Competition

Class I—Residential Lighting

Presiding — Jack T. Cottingham, Portland General Electric Co., Portland, Ore.
Canadian Region—Gwen Butterworth, John C. Virden Ltd., Toronto, Ont.
East Central Region—Elizabeth A. Meehan, Philadelphia Electric Co., Philadelphia, Pa.
Great Lakes Region—Hazel Harbauer, Toledo Edison Co., Toledo, Ohio.
Inter-Mountain Region—William B. Keller, Keller Engineering Co., Phoenix, Ariz.
Midwest Region—Robert C. Jacobsen, Consolidated Engineering Corp., Omaha, Nebr.
North Central Region—Donald D. Olson, Dick White Lighting Inc., Minneapolis, Minn.
Northeastern Region—John Northrup, Jr., C. S. Mersick Electric Supply Co., West Haven, Conn.
Pacific Northwest Region—Grace Schoeni, Portland General Electric Co., Portland, Ore.
South Central Region—May Love Gale, Tennessee Valley Authority, Nashville, Tenn.
Southeastern Region—Glenwood Yopp, Design Lighting, Raleigh, N. C.
South Pacific Coast Region—P. R. Darnton, Pacific Gas and Electric Co., Salinas, Calif.
Southwestern Region—Glenna Kobel, Oklahoma Gas & Electric Co., Oklahoma City, Okla.

Class II—

Commercial and Other Lighting

Presiding—Raymond L. Smart, Boston Edison Co., Boston, Mass.
Canadian Region—Gerard Denis, Shawinigan Water and Power Co., Trois-Rivieres, Que.
East Central Region—Albert A. Fox, Washington, D.C.
Great Lakes Region—Fred L. Lantz, Giffels & Rossetti Inc., Detroit, Mich.
Inter-Mountain Region—Harold Stead, Arizona Highway Dept., Phoenix, Ariz.
Midwest Region—Chas. J. Werp, Kirkham, Michael & Associates, Omaha, Nebr.
North Central Region—Melvin Cohen and Leo Chicca, A. Epstein & Sons, Inc., Chicago, Ill.
Northeastern Region—Carl R. Johnson, Controlescent Lighting Corp., Upper Montclair, N.J.
Pacific Northwest Region—Gene C. Ibsen, Stagecraft Industries Inc., Portland, Oregon.
South Central Region—Mario G. Zervigon, Zervigon, Goldstein Associates, New Orleans, La.
Southeastern Region—John L. Ponzer, Carolina Power & Light Co., Southern Pines, N.C.

(Continued on page 19A)

SAFE *floodlights*
for any explosion-prone area

These incandescent floodlights are explosion-proof and weatherproof . . . ideal for lighting hazardous areas such as this.

***ADDR-12.** Dust-ignition-proof floodlight. On aluminum dolly to fit over 33-inch manhole.

****RCDE-8.** Explosion-proof incandescent floodlight. Prisms treated to eliminate glare.

*****EVH.** Explosion-proof hand-lamp. Rain-tight, weather-resistant and easy to re-lamp.

What's your illuminating problem?

- Perhaps your problem is dust-ignition-proof floodlighting for dry, dusty, hazardous areas.*
- Possibly you're interested in explosion-proof incandescent floodlights for flush ceiling mounting — something that might be suitable for use in a process control room.**
- Maybe you're looking for rugged, explosion-proof hand lamps — for safe lighting of interiors of large fuel tanks during cleaning or painting operations.***

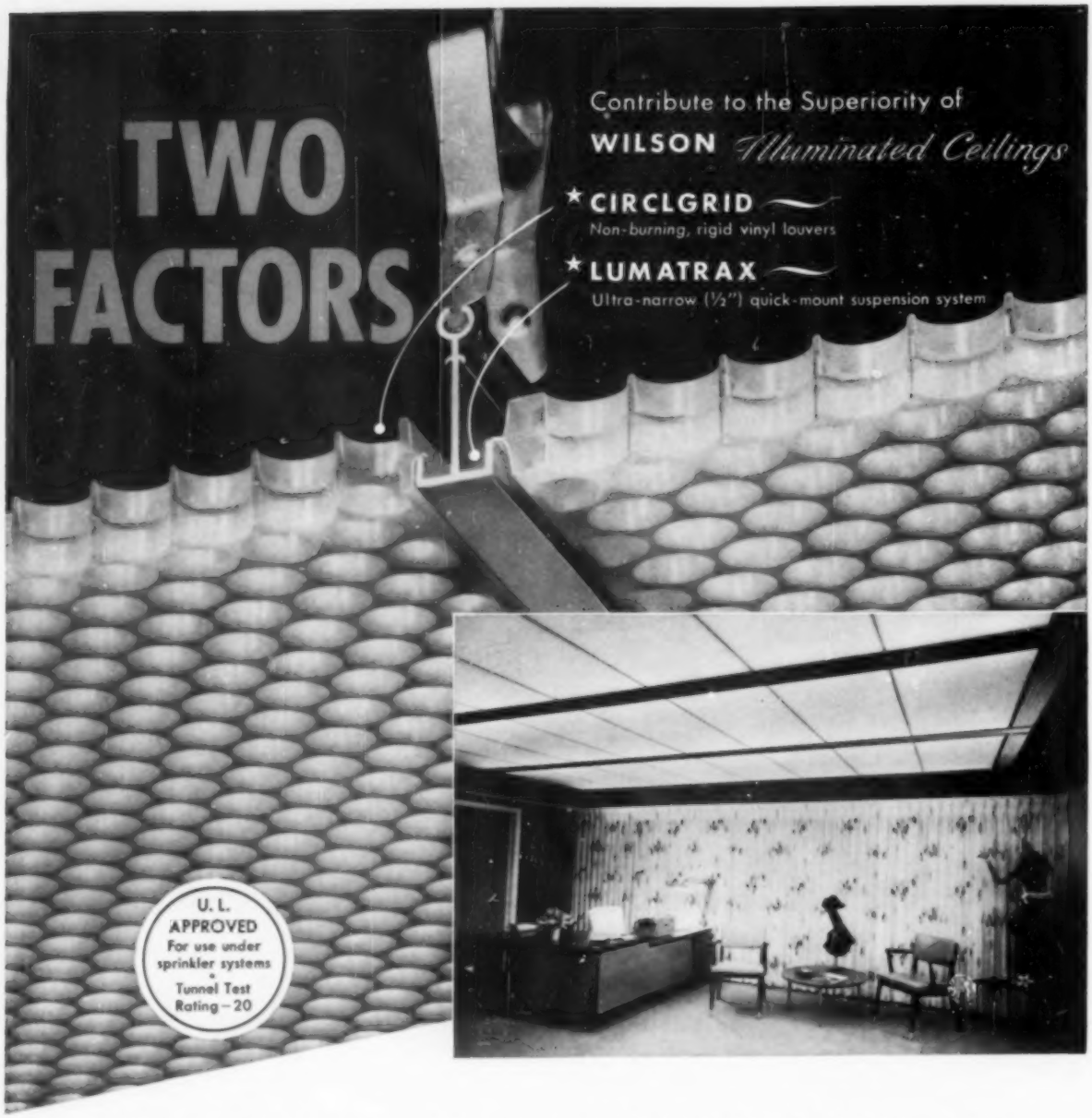
Whenever and wherever explosion-proof illumination is needed — whether in fluorescent, mercury vapor or incandescent lamps — Crouse-Hinds has a unit to fit your application need.

Check Catalog 320 for floodlights and Catalog 3000 for hand lamps. Or, see your Crouse-Hinds Distributor.

CROUSE-HINDS

REG. U. S. PAT. OFF.

MAIN OFFICE: SYRACUSE, N.Y. **FIELD OFFICES:** Albany, Atlanta, Baton Rouge, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Oregon, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Tampa, Tulsa, Washington. **RESIDENT REPRESENTATIVES:** Baltimore, Md., Meriden, Conn., Reading, Pa., Richmond, Va., Springfield, Mass. **FOREIGN AFFILIATES:** Crouse-Hinds Company of Canada, Ltd., Scarborough, Ont., Crouse-Hinds-Domex, S. A. de C. V. Mexico, D. F. **MANUFACTURING LICENSEE:** Peterco, Sao Paulo, Brazil



Ageless in beauty . . . versatile in performance, Wilson Illuminated Ceilings are rapidly becoming the architect's favorite lighting system for new construction or relighting.

★CIRCLGRID non-burning vinyl louvers feature thousands of tiny circles in transmitting soft diffused light, permitting intensities ranging to 200 foot candles. CIRCLGRID 2′ x 2′ and 2′ x 4′ panels consist of two non-combustible sheets of rigid vinyl electrically welded for great structural strength . . . with weight of only 3½ ozs./sq. ft.

These popular CIRCLGRID louvers meet rigid fire code standards for metropolitan buildings . . . they possess acoustical properties, permit air conditioning and sprinkler systems to function efficiently and the louvers are easily cleaned by rinsing in mild detergent.

★LUMATRAX exposed grid system offers the advantages of narrow support members and simplicity of installation. The tracks level quickly and perfectly by Wilson's exclusive spring clip. LUMATRAX is available in ½" E track (straight or contoured) . . . and 15/16" T track.

In other words, Wilson Illuminated Ceilings are recognized by leading architects and contractors as the outstanding system in the lighting field.

Write for Circlgrid and Lumatrax technical literature concerning the installation you are now working on.

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ENGLAND, Harris & Sheldon Electrical Ltd. • AUSTRALIA, Greendale Engineering Company
SOUTH AFRICA, New-Era Lighting • MEXICO, Quinzanos

(Continued from page 16A)

IES Gold Medalists

1944	George H. Stickney
1945	Preston S. Millar
1946	E. C. Crittenden
1947	Matthew Luckiesh
1948	Sir Clifford Paterson
1949	Ward Harrison
1950	W. F. Little
1952	H. H. Magdsick
1954	E. F. Lowry
1955	J. L. Stair
1956	George S. Crampton
1957	John O. Krachenbuehl
1958	C. A. B. Halvorson
1959	N. A. Halbertsma
1960	Willard C. Brown
1961	Deane B. Judd

South Pacific Coast Region—Hunter Lauer, Pacific Gas & Electric Co., Oakland, Calif.
Southwestern Region—L. Dowell Weeks, Bernard Johnson & Associates, Houston, Texas.

Applications II

Chairman: C. A. Douglas, National Bureau of Standards, Washington, D.C.
Discussion Organizer: W. C. Fisher, Federal Aviation Agency, Washington, D.C.
Hangar Lighting at New York International Airport—Walter Faktor, Irving Fishman and Henry W. Wenson, Jr., Port of New York Authority, New York, N.Y.
Lighting of Heliports—Victor E. Converse, Port of New York Authority, New York, N.Y.
Aircraft Exterior Lights for Preventing Mid-Air Collisions—T. H. Projector, Consulting Engineer; J. E. Robinson, Jr., and K. G. Cook, Applied Psychology Corp., Arlington, Va.; and J. A. Bartelt, Dept. of the Navy, Bureau of Naval Weapons, Washington, D. C.

Residential Lighting Forum

Chairman—Aileen M. Page, General Electric Co., Cleveland, Ohio.
How to Increase Reading Speed—Dr. Bernard C. Jander, Webster Groves, Mo.
Picture Your Lighting Installations—T. E. Knowles, General Electric Co., Cleveland, Ohio.
Whys and Hows of Recessed Lighting—Nelson Bleisch, Moe Light Division of Thomas Industries Inc., Ft. Robinson, Wis., and Norman Raab, Union Electric Co., St. Louis, Mo.

Research II

Chairman—H. F. Davidson, J. A. Wilson Lighting Ltd., Toronto, Ont.
Discussion Organizer—W. H. Kahler, Westinghouse Electric Corp., Cleveland, Ohio.
Further Appraisals of Luminaire Brightness—Willard Allphin, Sylvania Electric Products Inc., Salem, Mass.
A Mathematical Equivalent of the "Scissors Curve"—John J. Neidhart and Theodore Ake, Jr., The Miller Co., Meriden, Conn.
New Light on Visual Threshold Contrast—N. W. Taylor, Minnesota Mining and Manufacturing Co., St. Paul, Minn.

September 28

Applications III

Chairman—R. A. Palmer, Duke Power Co., Charlotte, N.C.
Discussion Organizer—Milton Buzan, Day-Brite Lighting Inc., St. Louis, Mo.

(Continued on page 22A)

GOLD MEDAL ACCEPTANCE ADDRESS

By Deane B. Judd

I am most grateful that the Illuminating Engineering Society has deemed me a worthy recipient of the IES Gold Medal. Although I have never been a member of your Society, I have several colleagues and collaborators and many friends among you. My first thought on receipt of the letter giving me the unexpected good news was that, considering all the help freely given to me by members of the IES in my work on color vision and color measurement, it would be more appropriate for me to find some suitable way to express my appreciation to IES. I have always realized that the IES through its committees and members was helping me in my work, and it strikes me as extraordinarily gracious of the IES to honor *me* for accepting this help.

Although it is often forgotten, sometimes by me, color vision and color measurement are properly the concern of illuminating engineers. One of the fundamental uses of light, perhaps the most fundamental, is to reveal color differences. In signaling, the color differences perceived are those among the signal lights themselves; in the inspection of industrial products, the color differences are those between object colors; and in the lighting of living and work spaces, the color differences to be perceived are those between different elements of the visual field which reveal to us not only the colors of the objects surrounding us, but also their solidity, fine details, and spatial arrangement. The whole success of a lighting installation might be analyzed in terms of the color differences revealed by it.

On looking back over the years I realize that the IES has always been mindful of its concern with color vision and color measurement. It came as somewhat of a shock to me when I first realized in 1931 that the only fundamental color standards adopted for international use had come out of the International Commission of Illumination, which then as now received its chief support in this country from IES. I was likewise somewhat surprised, though I should not have been, to discover a few years later that the IES Committee on Nomenclature had very definite and pertinent ideas to advance regarding the complicated terminology of color. Through its Color Committee and Light Sources Committee, particularly the Subcommittee on Color Rendition, IES has stimulated much valuable research work in color, and through the Illuminating Engineering Research Institute has given financial support to such work, and continues to do so.

I see now, what I should have seen all along, that IES considers itself a partner, and has fulfilled the obligations of partner, to a large fraction of all American research in color. Through its collaboration with other organizations (such as the American Institute of Architects, the Research and Engineering Council of the Graphic Arts, and the Inter-Society Color Council, to name a few) IES has made itself a potent and constructive force in the color research not directly under its own sponsorship, just as it has in the color research motivated by its own committees.

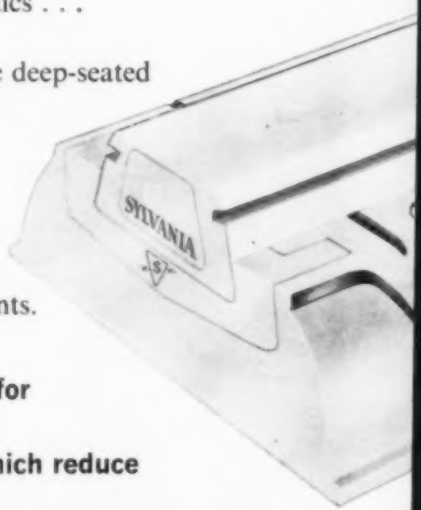
I have the feeling that the award to me of the IES Gold Medal is an offical recognition by the Society that IES members, with whom I have worked, and I, jointly, have achieved some worthwhile advances. The honor of this award is thus to be shared with such IES members as Barbrow, Clark, Crouch, Farnsworth, Finch, Fry, Guth, Jerome, Macbeth, Nickerson, and Teele, and in this sense I am more than happy to accept the IES Gold Medal for 1961.

The Ideal Answer to Your Industrial Lighting Problems... Sylvania's New

Here is a totally-new series of industrial lighting fixtures designed to make your lighting fixture selection simple and positive.

Sylvania's Power-V Series includes *all of the features you want* in industrial lighting equipment—ruggedness, versatility, adaptability, ease of installation and maintenance, trimness, simplicity, high efficiency, excellent lighting characteristics . . . and all at competitive prices.

This is a completely modern fixture series from the deep-seated channel design to the wide, rugged embossed reflector.



The Power-V Series is designed to provide the high level, quality lighting job you need to increase production and efficiency and to decrease rejects and accidents. Because of the wide choice of models and lamp types, you can practically custom-design a lighting system to fit your exact illumination requirements.

Each Power-V model features:

- **Reflectors with deep embossments and ribbing for strength and rigidity.**
- **Simplicity of design and labor-saving devices which reduce installation and maintenance time.**
- **Excellent lighting characteristics with 430 ma Rapid Start and Instant Start; 800 ma Rapid Start; or any size of the powerful 1500 ma Rapid Start lamps.**
- **A low silhouette to provide neat, trim appearance.**

From every angle, we believe the Power-V Series to be the finest line of industrial lighting fixtures ever produced. May we send you the details? Just write to:

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A Division of SYLVANIA ELECTRIC PRODUCTS INC.
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For New Construction or Industrial Modernization...
Be Sure to Investigate Sylvania's **Power-V** *Series*

Power-V Series

RUGGED

Strong, rigid fixtures featuring double-V embossments on reflector. Withstands rough handling or accidental bumps and abuse.

POWERFUL

Recommended footcandle levels are reached easily with Power-V . . . and you maintain quality standards, too. Designed to use 430 ma, 800 ma or all types of 1500 ma lamps.

NEAT

Trim, shallow appearance assured through positive integration of channel and reflector. Low silhouette enhances any installation.

SIMPLE

Clean design, minimum parts, labor-saving devices add up to simplicity of installation and maintenance.

LIGHTING FIXTURES BY

SYLVANIA

SUBSIDIARY OF

GENERAL TELEPHONE & ELECTRONICS

GENERAL TELEPHONE SYSTEM

DALLAS NEXT YEAR—delegates to the 1961 Technical Conference get the "low-down" on what to expect in Dallas, at the 1962 Conference at the Statler-Hilton Hotel. The Western lasses—North Texas Section delegates.

(*Continued from page* 19A)

Design of Large Scale Electroluminescent Panel Lighting Systems—Joel E. Rubin, Kliegl Brothers Lighting, New York, N.Y., and P. F. Dietz, Westinghouse Electric Corp., Bloomfield, N.J.

Quartz Iodine Lamps and Football Field Lighting—Ronald L. Paugh, D. A. Toenjes and G. R. Baumgartner, General Electric Co., Cleveland, Ohio.

Lighting Apple Packing Area—Marvin E. Heft, Jr., University of Connecticut, Storrs, Conn., and D. E. Wiant, Michigan State University, East Lansing, Mich.

Fluorescent Lamps and Commercial Applications—R. N. Edwards, Jr. Rambusch Decorating Co., New York, N. Y., and K. H. Thompson, Westinghouse Electric Corp., Cleveland, Ohio.

Photometry

Chairman—A. K. Gaetjens, General Electric Co., Cleveland, Ohio.

Discussion Organizer—A. R. Chick, Electrical Testing Laboratories Inc., New York, N.Y.

Zero Length Searchlight Photometry System—John Johnson, U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Photometry of Fluorescent Luminaires, Rotating Photocell Method— Donald Dunlop, Hexcel Products Inc., Berkeley, Calif., and D. M. Finch, University of California, Berkeley, Calif.

Searchlight Beam Spreads from Horizontally Elongated Sources—Stanley M. Segal and S. B. Gibson, U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Matched Filament and Reflector Contours—Domina Eberle Spencer, University of Connecticut, Storrs, Conn.

Applications IV

Chairman—B. S. Benson, Jr., Benjamin Division, Thomas Industries Inc., Des Plaines, Ill.

Discussion Organizer—C. Carter Lewis, Union Electric Co., St. Louis, Mo.

Combating Juvenile Delinquency with Light—Alexander Lurkis, Acting Commissioner, Dept. of Water Supply, Gas and Electricity, New York, N.Y.

Design Considerations in a Small, Multi-Use Auditorium—Alston Rodgers, W. D. Riddle, and R. T. Dorsey, General Electric Co., Cleveland, Ohio.

Comparisons of Recessed, Ceiling-Mounted and Suspended Office Lighting Systems—C. L. Amick and R. D. Bradley, Day-Brite Lighting Inc., St. Louis, Mo.

Roadway Lighting

Chairman—T. J. Seburn, Yale University, New Haven, Conn.

Discussion Organizer—D. R. Brown, Crouse-Hinds Co., Syracuse, N.Y.

Light Distributions for Effective Control of Glare in Roadway Lighting—Arthur W. Fowle and R. L. Kaercher, Holophane Company Inc., Newark, Ohio.

A New Approach to Four-Way Luminaire Design—Daryl D. Sullivan, Corning Glass Works, Corning, N.Y.

An Outdoor Fluorescent Luminaire with Optimum Light Output Over a Wide Temperature Range—Harold A. Van Dusen, Jr., and Edward F. Schraith, Line Material Industries, South Milwaukee, Wis.

EEI Recommends Participation of Utilities in Attack Warning System

Edison Electric Institute has recommended that the nation's electric utility companies participate in the proposed National Emergency Alarm Repeater (NEAR) system, a countrywide warning against enemy attack. The NEAR system, proposed by the Office of Civil Defense, is a household warning system which operates on electrical impulses imposed on regular power lines. Small alarm receivers plug into ordinary appliance outlets.

Testing of the NEAR program on the lines of the Consumers Power Co. in Michigan has been underway for a year, with a demonstration held during October 1960 in Charlotte. If tests prove successful, the government proposes to begin nationwide installation of the system. Details for implementation of the program, suggested by Secretary of Defense Robert S. McNamara last August, include the use of federal funds to cover the cost of signal generators and the sale of receivers to the general public.

Following an extensive study of the NEAR system, the Edison Electric Institute announced that "a warning system operating through transmission and distribution lines is a program in which electric utilities can and should participate in the interests of national defense." EEI has offered full cooperation to the Office of Civil Defense for further testing of the program.

Philadelphia Site For Plant Exposition

The 1962 Plant Engineering & Maintenance Show will take place at Convention Hall, Philadelphia, January 22-25. The exposition will coincide with the 13th annual Plant Engineering and Maintenance Conference.

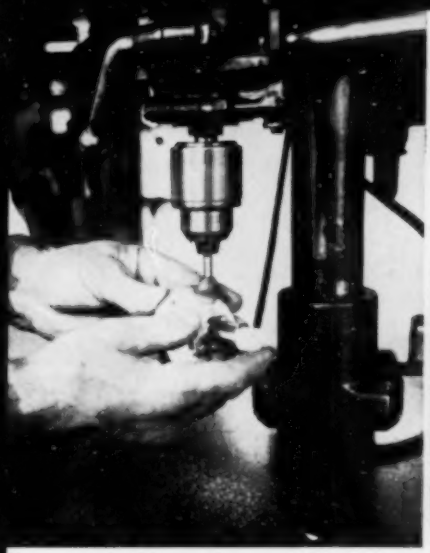
An estimated 400 companies are expected to exhibit a wide range of the latest maintenance equipment. Show, conference and hotel information may be obtained from the producers, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

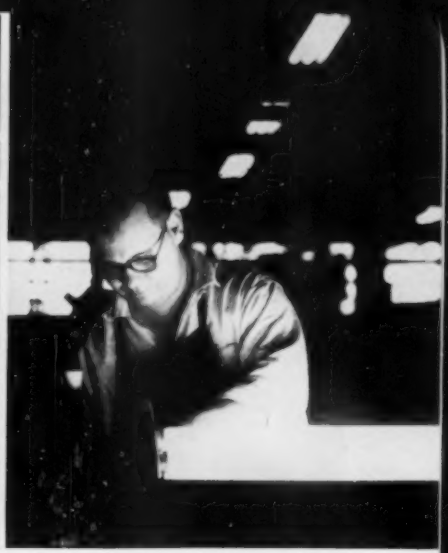
J. M. Waldram Addresses IES New York Section

John M. Waldram, senior lighting research engineer, General Electric Co., Ltd., England, opened the New York Section's 1961-1962 technical program with an address on "Lighting and Architecture."

Using a description of the illumination of the Gloucester Cathedral in England, Mr. Waldram introduced a method of calculation which accurately predicts the esthetic and technical results of a lighting installation. Comments on the presentation by Jo Miel-

(*Continued on page* 25A)





Careful attention to design and construction refinements characterize Revere's standard line. These same skills help answer the unusual equipment needs brought to Revere by volume users of specialized outdoor lighting products.

What makes Revere the consultant's choice for outdoor lighting?

Revere capacity gives you wider choice of standard equipment and excellent service on custom designs

You can solve the vast majority of outdoor lighting problems with the wide line of standard equipment listed in Revere's catalog. And for unusual application requirements, you can get prompt service on custom-engineered equipment or modifications of our standard designs.

Revere's high-volume production capacity and large inventory account for the great selection of equipment available for immediate delivery. Special facilities account for fast service on custom equipment available in production quantities for volume users. And Revere's policy of designing *up* to a performance level, never down to a price level gives users all the light they pay for in fixtures that outlast even their own expectations.

Revere offers consulting engineers and their clients the industry's widest line of outdoor fluorescent, incandescent and mercury luminaires as well as poles and accessories — *design* matched for best appearance and peak lighting efficiency, and *structurally* matched for strength, balance and trouble-free installation. For complete descriptive and technical data, write for your copy of Revere's comprehensive outdoor lighting catalog. For information on custom engineered lighting equipment, feel free to consult your Revere sales engineer. He can show why Revere is the consultant's choice.

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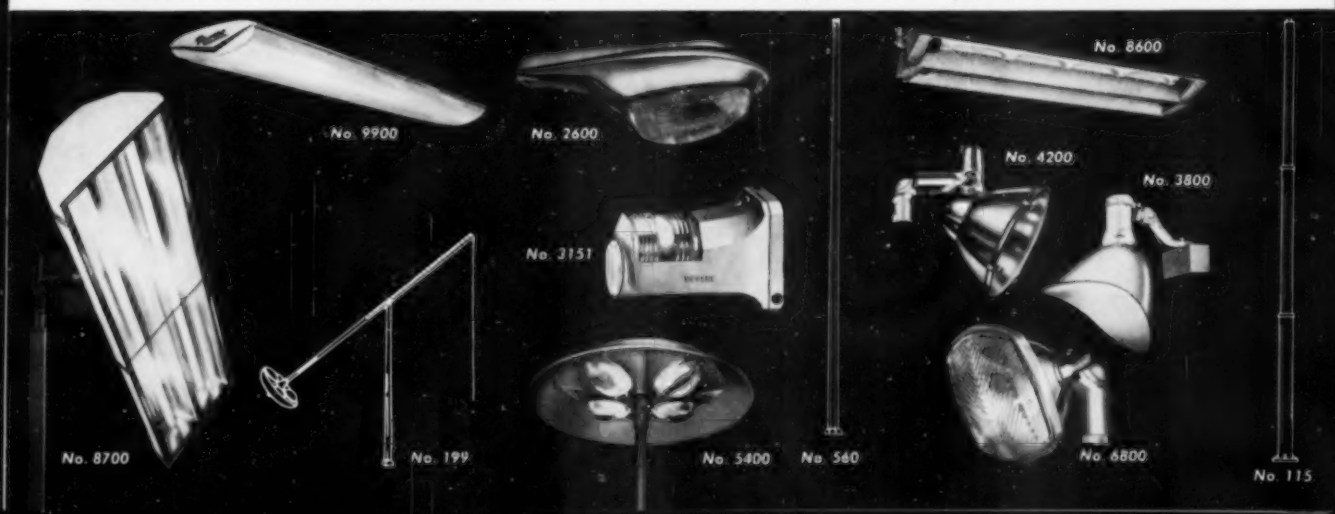
Selecting everything you need in outdoor lighting from one reliable source saves time, trouble and money. Shown are just a few representative fluorescent, incandescent and mercury fixtures and poles from Revere's wide line.



St. Paul's Evangelical Lutheran Church, Baltimore, Maryland, Gaydreau & Gaudreau, Architects

The Rambusch Dome is an efficient downlighting device with widespread light distribution and comfortable brightness contrast. Designed for ambient or general illumination, the dome can be recessed mounted, surface mounted, or pendant. It is adaptable for all types of ceiling construction, including hung pan and acoustical tile. Domes are available in four sizes from 19 to 43 inches in diameter and utilize standard lamps ranging in wattage from 150 to 500 Watts. Write for detailed data sheets DO-1 and DO-3 or see Sweet's Catalog—Lighting 33a/Ra

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Gulfstream, Blue Ridge Chapters Chartered

Official charter presentation to Blue Ridge Chapter, Roanoke, Va., was made on September 12 by East Central regional vice-president Carman Miller (left in photo at left above) to chairman John Manos. At right above, the 49 members and guests in attendance at dinner meeting. Head table dignitaries, in addition to RVP Miller and chairman Manos, include: J. W. Wall, vice-chairman; W. A. Sowers, secretary-treasurer; Walker Graves, board of managers.

Gulfstream Chapter (Ft. Lauderdale, Fla.) charter meeting at Space Satellite Hotel, Pompano Beach, Fla., featured charter presentation by Southeastern regional vice-president T. L. Cordle (second from left, photo at right) to 1960-1961 chairman Thomas Kendrick. Official gavel was presented to new chapter by George Gill (left), chairman of parent Southeast Florida Section. At right is Robert Mills, 1961-1962 Gulfstream chairman.

(Continued from page 22A)

zener, famed Broadway set designer and lighting consultant, and Bonnell Irvine, director of the New York office of Welton Becket and Associates, architects, supplemented the lecture.

Mr. Waldram has been in the United States for the past several months, during which he has spoken at several IES functions. His invited paper on "Visual Studies of Driving in Traffic Routes and on Motorways" was one of the highlights of the recent National Technical Conference in St. Louis.

Gold Medal Nominations Due January 1

According to official IES procedures, nominations for the Gold Medal Award for 1962 must be received at the headquarters office by January 1.

Nominees need not be members of the Society, nor citizens of the United States or Canada. Nominations may be made at any time, by any member of the Society, by presenting, to the General Secretary, the name of the individual whose accomplishments in his field are deemed worthy of such recognition. This field may be engineering, design, applied illumination, optics, ophthalmology, lighting research, education, or administration and management. Nominations and records from previous years, as reviewed and referred to the following year's committee, are given consideration along with new nominations.

The Gold Medal, the Society's highest award, is given "for the purpose of giving recognition to meritorious achievement which has conspicuously furthered the profession, art or knowledge of illuminating engineering." It is accompanied by an appropriately embossed parchment certificate of award.

The 1961 Medal was presented to Deane B. Judd, National Bureau of Standards, the leading expert on colorimetry in the United States.

Sperry, Western Electric Sign Licensing Agreement

An agreement to cross-license all patents involving communications, data processing and electronic switching equipment on a world-wide, nonexclusive basis, was recently announced by Sperry-Rand Corp. and Western Electric. The agreement, effective September 27, covers all existing and future patents of both corporations and their associated and subsidiary companies.

Memorial Contribution to UEC Honors James F. Williams

A contribution to the United Engineering Center building fund has been made by the residential lighting department, Dayton Power & Light Co., in honor of James F. Williams, recently deceased member of the Miami Valley Section. Mr. Williams, who died of a heart attack on September 10, had

(Continued on page 28A)

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the other three approved brands.

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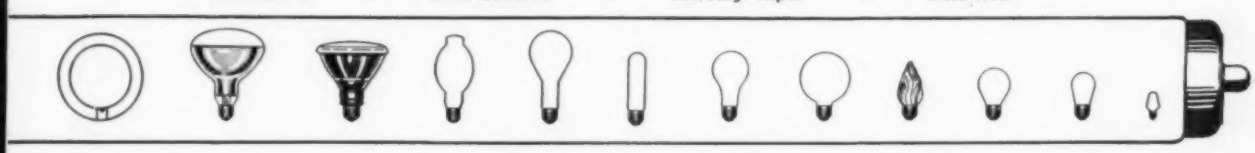

INSTALLATION of 1961-1962 officers, Arrowhead Chapter, San Bernardino, Calif. Gavel of office was presented by Roy Kreyser, South Pacific Coast regional vice-president (second from left) to Reed Goddard, incoming chairman. At far left is Stan Mallory, vice-chairman; from right, Art Stuart, Chauncey Voorhies and Gordon Burgess, members of the board of managers. IES General Secretary Charles L. Amick, Day-Brite Lighting, Inc., St. Louis, Mo., was featured technical speaker at the dinner meeting.

(*Continued from page 25A*)

served as membership chairman of the Section for the past several years. Last year's one-third per cent increase in Section membership, including many architects and consulting engineers, has been attributed primarily to his efforts.

An intensive membership campaign for this year, planned by Mr. Williams shortly before his death, is now being conducted as the "Jim Williams Membership Drive." As an incentive in the drive, a framed IES membership certificate or membership pin will be awarded to campaigners for each two new members secured.

Building Research Institute Now Independent Technical Society

Leon Chatelain, Jr., president of the Building Research Institute, has announced that the BRI will assume the status of an independent, nonprofit technical society of building science during the coming year. The Institute was organized 10 years ago under the Division of Engineering and Industrial Research of the National Academy of Sciences—National Research Council.

The change in status, reflecting the 10-year growth of the organization, will be accompanied by a broadening of the Institute's activities in its non-commercial approach to the stimulation of new research, administration of cooperatively sponsored research projects and the acceptance of research grants. The BRI will continue to function as a membership organization, presenting its semi-annual research conferences, publishing technical reports, continuing the monthly *Building Science News*, the *Building Science Directory* and the documentation service. Expansion of the organization's technical activities is also expected to make possible the planned extension of the present monograph series of publications.

Members of the BRI will convene for the 1961 Fall Conferences on November 28-30 at the Mayflower Hotel in Washington, D. C. The program of six technical conferences will review: prefinishing of exterior building components, performance of plastics in buildings, mechanical fasteners for wood, identification of colors for building, building cost analysis and design for the nuclear age. Preliminary program and registration material is available from Milton C. Coon, Jr., BRI Executive Director, 2101 Constitution Ave., Washington 25, D. C. Conferences are open to the public as well as to BRI members and guests.

Philadelphia Students Attend Construction Industry Conference

Approximately 400 selected high school students and their guidance counselors from the five-county Philadelphia area were guests of scientific and professional organizations in the construction industry at a full-day conference on October 11. Designed to interest talented youngsters in the construction field—architecture, engineering and building—the conference is believed to be the first such meeting planned specifically for students.

The conference program included a tour of construction projects in University City, speeches by prominent representatives of the industry and a film on recent and future construction in the city of Philadelphia. Co-sponsors of the meeting were the Philadelphia Chapters of the American Institute of Architects, the American Society of Civil Engineers and the Pennsylvania Society of Professional Engineers, in cooperation with The Franklin Institute and the Industry Advancement Program of the General Building Contractors Association, Inc.

Merger of "Advanced Management," "Office Executive" Announced

The merger of *Office Executive*, publication of the National Office Management Association, and *Advanced Management*, organ of Society for the Advancement of Management, has been announced. The first issue of the new monthly publication, *Advanced Management - Office Executive*, will appear in January, 1962. Circulation of the magazine is estimated at approximately 36,000, including 7000 student members of the SAM university chapters.

Editorial goal of the *Advanced Management - Office Executive* is the complete coverage of management responsibilities and opportunities with emphasis on the discussion of new management trends and concepts. Specific editorial, advertising and other business arrangements will be announced soon.

Survey Reports Reactions of Engineering Show Visitors

An analysis of visitor reactions to industrial expositions and suggestions for improvements in exhibition booths are the subjects of a new booklet, "What They Want," prepared by Clapp & Poliak, Inc., New York producers of industrial shows. The booklet reports the results of a survey conducted at the Design Engineering Show, held at Cobo Hall, Detroit, earlier this year. Single copies of the booklet are available without charge from Clapp & Poliak, 341 Madison Ave, New York 17.

Nine major points for improvement in industrial exhibitions were revealed in the study: more technically qualified booth personnel; alert and well-trained personnel; less high pressure selling and more engineering design information; fewer pretty girls with no information; maximum number of products and features; more product applications; better technical literature; greater emphasis on the display of newest products and reports on research and development activities; and

(*Continued on page 30A*)

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Installations in the News . . .

Nighttime Lighting Creates Gay Atmosphere

An atmosphere of gaiety and warmth was produced with improved-color mercury lighting at the Edward J. Murray Memorial Center, Yonkers, N. Y. The center, an outdoor roller-skating rink and dance floor semi-enclosed by an arched roof, is illuminated with four rows of 400-watt mercury lamps. The upper two rows of lights have "high bay" reflectors, the lower rows, "low bay." The lights are mounted on roof-supported beams, on 20-foot centers in one direction, and on 25-foot centers in the transverse direction. Conduits for wiring are secured to the lower edges of the beams, and the connections made from these conduits to the luminaires. "Two-light" transformers located at the high bays serve both high and low bay fixtures. In addition, six 200-watt incandescent lights are located above the spectator stands, three bracket-mounted to the roof beams on each side of the arena. Office and shop entrances, at far end of the arena, have six bowl-shaped luminaires mounted in two rows in the canopies covering them.

Photo and data are courtesy *Retailer's Review*, Madison, Wis.

(*Continued from page* 28A)

exhibit designs which facilitate convenient study and understanding.

A summary to the booklet emphasizes the need for engineer-oriented demonstrations and rigorous avoidance of institutional exhibits.

New Science/Technology Magazine Begins Publication in January

Plans for the publication of a new monthly magazine, *International Science and Technology*, beginning in January 1962, have been announced by Conover-Mast. The magazine will be sent without charge to scientists, engineers and technical management personnel in research, development, design and manufacturing operations in industry, government and independent research organizations.

A 116-page prototype of the magazine, edited to "provide the specialist with the first practical means of keeping up with significant developments in areas other than his own which may have an important bearing on his work," has been circulated. Those interested in and qualified to obtain a copy of the sample issue should send a request, on official letterhead, to: Circulation Manager, International Science and Technology, 205 East 42nd St., New York 17, N. Y.

Recent Awards and Medals

Fall roundup of 1961 scientific and engineering award winners includes:

The British IES Gold Medal—H. C. Weston, London, for his contributions to lighting and the IES Code.

The John Fritz Medal Board of Award —Crawford A. Greenwalt, president, E. I. du Pont de Nemours & Co., for his achievements in translating his research into useful application.

The 1962 Industrial Research Institute Medal—Dr. Guy Suits, vice-president and director of research, General Electric Co., for his success in developing an industrial research laboratory.

The James H. McGraw Award for Electrical Contractors—Charles W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C., for his leadership in organizing line construction contractors into effective regional chapters.

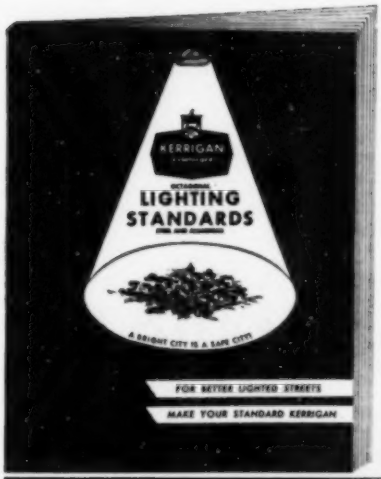
The Standards Engineers Society presented several awards. Two Joint SES-American Society for Testing Material Awards went to H. Thomas Hallowell, Jr., Standard Pressed Steel Co., Jenkintown, Pa., for service in the interest of standardization, and Ruth E. Mason, for her contribution to literature on standards. Four Fellows were named: Herbert C. Arlt, Bell Telephone Laboratories, Inc.; Arthur E. Pringle, II, president, Pringle Electrical Manufacturing Co.; J. Robert Walgren, Aluminum Co. of America; and Samuel H. Watson, Radio Corp. of America. Special Service Citations were given to Antoine Gagne and Victor S. Cuttens. Winner of the Competitive Paper Contest was John T. Milek, Hughes Aircraft Co.

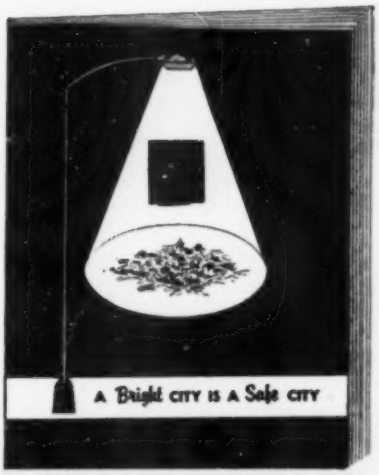
!!!

New ideas for courses . . . From the Chicago Lighting Institute and the IES New York Section come interesting new ideas for lighting courses. CLI's symposium on funeral home lighting (co-sponsored with the Illinois and Chicago Funeral Directors' Associations) is believed to be the first comprehensive lighting program devoted to this subject. Attendance upwards of 75 indicates that this subject might be a welcome topic for lighting lectures.

New York Section's *intermediate* course, filling the gap between fundamentals and advanced courses, should be the harbinger of a new trend in Section/Chapter education programs. Curriculum notice indicates plans for the review of fundamentals important to architectural and engineering problems, contemporary techniques and workshop sessions. Interested S/C education chairmen can obtain detailed information from course coordinators, Herbert Hoffman, Condi-Lite Corp., 889 Broadway, New York, N. Y., or A. R.

(*Continued on page* 33A)





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Here's aid for you in planning your street and highway lighting projects. Seven catalogs describe and illustrate (with full engineering data) our new line of attractive, *round tapered* aluminum shafts . . . . trim-tapered octagonal standards in steel and aluminum . . . . traffic signal structures . . . . strain poles . . . . brackets and mast arms . . . and overhead sign supports. All seven are available to you free. Send for your copies NOW. Brighten up YOUR city or town!

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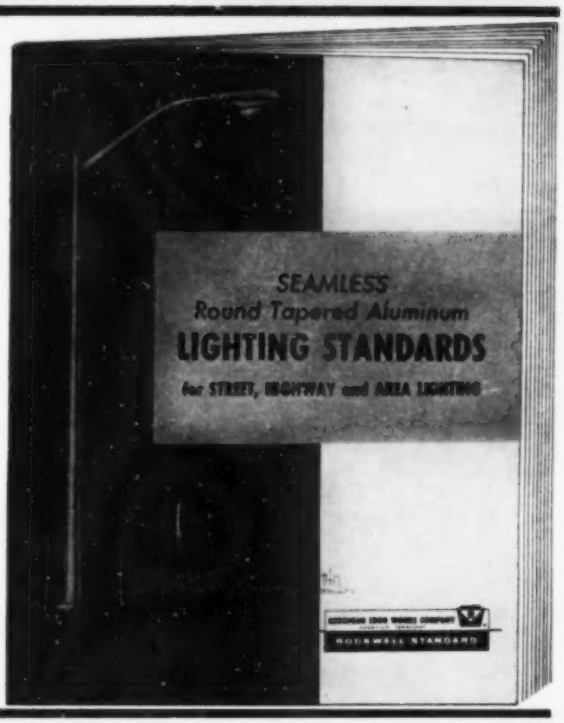

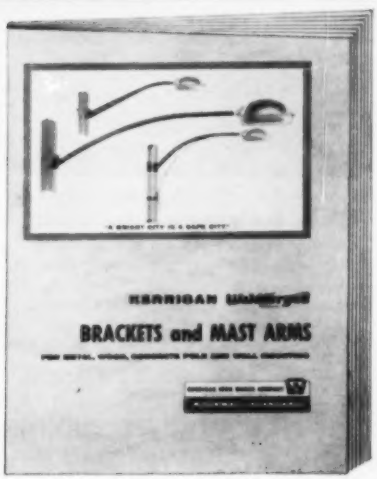

New findings verify benefits of Fiberglas Polarizing Light Panels

Fiberglas Polarizing Light Panels are lightweight, easy to handle, and easy to install. They are dimensionally stable and are available in sizes up to 24" x 48".

Recent tests conducted by Dr. Blackwell of Ohio State University, and reported before the National Technical Conference of the Illuminating Engineering Society, proved that polarization:

- Virtually eliminates reflected and direct glare
- Reduces veiling glare substantially
- Improves color definition dramatically
- Improves visual performance and task visibility to a startling extent over nonpolarized light at equal candle power.

These findings demonstrate that polarization can increase the usefulness of light without increasing footcandle power. Polarization converts ordinary lighting energy into energy that actually increases task contrasts and, as a result, improves visual performance.

Although the precise measurement is new, Fiberglas Polarizing Light Panels have been providing such benefits for two years in buildings throughout the United States. When you specify light fixtures, make sure they contain Fiberglas* Polarizing Light Panels to provide the advantages of this new dimension in lighting.

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(Continued from page 30A)

Chick, Electrical Testing Laboratories, 2 East End Ave., New York, N. Y.

ASTM changes name . . . The American Society for Testing Materials officially became the American Society for Testing AND Materials, with the signing of a court decree on September 18, 1961. The change, intended to place added emphasis on the Society's research work in seeking knowledge of the nature of materials, follows by two years the establishment of a Division of Materials Sciences. Familiar initials and symbol of the 63-year old Society remain the same.

60th anniversary of mercury lamp . . . September marked the 60th anniversary of Peter Cooper Hewitt's introduction of the mercury-vapor arc lamp, forerunner of the numerous electric discharge sources now on the market. Developed 22 years after Edison's first practical incandescent lamp, the original Cooper Hewitt source was four feet long and contained a considerable quantity of mercury which was partially vaporized when electric current was applied to electrodes at either end of the tube. An arc through the tube resulted in the production of the familiar greenish-blue light. First practical use of the lamp was in the photographic studios where the lack of red components did not impair usefulness. Today's sales of mercury lamps in the U. S. are estimated at approximately 1.2 million lamps annually.

School construction dollar . . . Recently released figures from the Bureau of Labor Statistics, U. S. Department of Labor, reveal that of each $1000 of school construction contracts, $555 are spent for materials. From the $555 pie, approximately $20 are spent for lighting fixtures. Other shares: electrical products (other than lighting), $38; plumbing $34; heating, ventilation, air conditioning equipment, $51.

Educate them early . . . J. A. Wilson Lighting Ltd., Toronto, may be able to take some credit for better understanding between future architects and illuminating engineers. The company is now in its third year of sponsorship of an annual illumination lectureship at the University of Toronto School of Architecture. Arrangements include seminars and discussions with students for two or three days before and after the formal lecture. Although the program is intended primarily for the student architect, practicing architects are invited and *do* attend. J. E. Waldram, senior research engineer, General Electric Co., England,

(Continued on page 34A)

SCHEDULED EVENTS

Dates of Interest to IES Members

1961

November

November 24-29 — 1961 Electrical and Home Appliance Show, Electric Building. Balboa Park, San Diego, Calif.

November 28-30—Building Research Institute, Fall Conference, Mayflower Hotel, Washington, D. C.

1962

January

January 22-25 — National Plant Maintenance & Engineering Show, Convention Hall, Philadelphia, Pa.

January 25-27—National Society of Professional Engineers, King Edward Hotel. Jackson, Miss.

January 29-31—American Society of Heating, Refrigerating and Air Conditioning Engineers, Semi-Annual Meeting, Chase Park Plaza, St. Louis, Mo.

January 29 - February 2 — Electrical Engineering Exposition, sponsored by the American Institute of Electrical Engineers, New York Coliseum, New York, N. Y.

January 30 - February 2 — Society of the Plastics Engineers, Annual Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa.

February

February 5-9—American Society for Testing Materials, Statler-Hilton Hotel, Dallas, Texas.

February 6-8—Society of the Plastics Industry, Reinforced Plastics Division Conference, Edgewater Beach Hotel, Chicago, Ill.

February 8-9 — IES Council Meeting, United Engineering Center, 345 East 47th St., New York, N. Y. Members are invited to attend meetings of Council as guests.

March

March 2-4—20th National Home Improvement Exposition, New York Coliseum, New York, N. Y.

March 9-11—National Electrical Industries Show, New York Coliseum, New York, N. Y.

March 15-17—Optical Society of America, Spring Meeting, Mayflower Hotel, Washington, D. C.

March 28-31—Eleventh Biennial Electrical Industry Show, sponsored by Electrical Maintenance Engineers Association of California, Shrine Exposition Hall, Los Angeles, Calif.

April

April 2-4—Edison Electric Institute Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill.

April 9-10—IES East Central Regional Conference, Traylor Hotel, Allentown, Pa.

April 12-13—IES Southeastern/South Central Regional Conference, King Edwards Hotel, Jackson, Miss.

April 16-17—IES Great Lakes Regional Conference, Dayton Biltmore Hotel, Dayton, Ohio.

April 24-26—Building Research Institute, Spring Conferences, Shoreham Hotel, Washington, D. C.

April 30-May 3—Design Engineering Show, McCormack Place, Chicago, Ill.

April 30-May 4—Society of Motion Picture and Television Engineers, Semiannual Convention, Ambassador Hotel, Los Angeles, Calif.

May

May 6-10—Electrochemical Society, Annual Meeting, Statler Hilton Hotel, Los Angeles, Calif.

May 10-11—IES Midwest/North Central Regional Conference, Radisson Hotel, Minneapolis, Minn.

May 14-15—IES Canadian Regional Conference, Winnipeg, Man.

May 17-18 — IES Pacific Northwest Region Conference, Davenport Hotel, Spokane, Wash.

May 21-22—IES South Pacific Coast Regional Conference, U. S. Grant Hotel, San Diego, Calif.

May 24-25—IES Inter-Mountain Regional Conference, Western Skies Hotel, Albuquerque, N. M.

June

June 4-6—Edison Electric Institute, Annual Convention, Atlantic City, N. J.

June 11-12—IES Northeastern Regional Conference, Hotel U. S. Thayer, West Point, N. Y.

June 13-16—National Society of Professional Engineers, Annual Meeting, Sheraton-French Lick Hotel, French Lick, Ind.

June 14-15—IES Council Meeting, United Engineering Center, 345 E. 47th St., New York, N. Y. Members are invited to attend meetings of Council as guests.

June 18-21—National Association of Power Engineers, National Convention, Statler Hilton Hotel, Washington, D. C.

June 27-29—Conference on Standards and Electronic Measurements, sponsored by the Institute of Radio Engineers, American Institute of Electrical Engineers and the National Bureau of Standards, Boulder, Colo.

September

September 9-14—Illuminating Engineering Society, National Technical Conference, Statler-Hilton Hotel, Dallas, Texas.

(Continued from page 33A)

delivered the 1961 lecture. Previous speakers have been Richard Kelly, New York lighting consultant-interior designer, and Wilbur Riddle, resident architect, General Electric Co., Nela Park, Cleveland.

Two new IES directors . . . By unanimous action of the IES Council on September 29, J. W. Griffith, Southern Methodist University, Dallas, Texas, and Vern Kempf, *Plant Engineering* magazine, Chicago, were named to fill two incompleted terms of Directors. Professor Griffith will serve until September 30, 1963, in the position left vacant by the election of Arthur C. Barr as IES Treasurer. Mr. Kempf will fill the unexpired term (to September 30, 1962), of Charles L. Amick, newly elected General Secretary.

January 31, deadline for 1962 conference paper outlines . . . Outlines of papers proposed for the technical program of the 1962 IES National Technical Conference in Dallas, September 9-14, must be in the hands of the Papers Committee chairman B. S. Benson, Jr., Benjamin Division, Thomas Industries, Inc., Des Plaines, Ill., by January 30. Further details on submitting outlines may be found in box below.

1962 Gold Medal . . . C. L. Amick, IES General Secretary, invites all Society members to submit nominations of candidates for the 1962 Gold Medal, lighting's highest award in the Western Hemisphere. Candidates for the Medal, awarded for "meritorious achievement which has conspicuously furthered the profession, art, or knowledge of illuminating engineering," need not be members of IES. See page 25A for full details of qualifications and nomination procedure.

British IES elects President . . . W. T. Souter, joint-managing director of Holophane, Ltd., has been elected President of the British Illuminating Engineering Society for 1961-1962. Mr. Souter has served on the Society's Council and several of its standing committees and recently completed a four-year term as chairman of the Technical Committee. He was installed on October 10.

ABOUT PEOPLE

Parenthetical designations indicate membership grade in the Society.

J. M. Gilbert, president of Silvray Lighting, Inc., Bound Brook, N. J., has announced the election of **Robert L. Levenstein** (A) as executive vice-president of the company. Mr. Levenstein most recently served as marketing manager and head of the Architectural Lighting Division of Lightolier, Inc.

Parker R. Lawson was elected president of the Pennsylvania Electric Association at the group's annual meeting. Mr. Lawson who is with the Pennsylvania Electric Co., Johnstown, succeeds **G. R. Parry,** vice-president of Metropolitan Edison Co., Reading, Penn. Also elected were **P. M. Alden** (M), Philadelphia Electric Co., Philadelphia, vice-president; **Charles S. Bowden,** Pennsylvania Power Co., New Castle, vice-president; and **R. W. Hurd,** West Penn Power Co., Greensburg, vice-president. **Harold A. Buch** was reelected as secretary-treasurer. **Frank H. Lichtenwalter** continues as vice-president and managing director.

Halo Lighting Products, Inc., Chicago, has announced the appointment of **Dan Thomson** as executive vice-president. Mr. Thomson was formerly the Halo Chicago plant's general manager.

Dr. Ralph P. Hudson has been appointed chief of the Heat Division at the National Bureau of Standards, U. S. Department of Commerce. He succeeds **Dr. Charles M. Herzfeld,** recently appointed an associate director of NBS. Dr. Hudson has been awarded the Department of Commerce Gold Medal and the Washington Academy of Science Award for his contribution in the joint discovery with four other scientists that the quantum mechanical law of conservation of parity does not hold in beta decay. He has also received a Guggenheim Award.

The appointment of **Ernest T. H. Bowen** as sales representative in North and South Carolina for the Progress Manufacturing Co., Philadelphia, has been announced by **Will Turner,** vice-president of marketing. Mr. Bowen was formerly an architect for Pullara, Bowen and Watson in Tampa, Fla.

Kerrigan Iron Works Co., Nashville, Tenn., has announced the appointment of **Tom Barney** as sales manager of Kerrigan Lighting Products. He was formerly general sales manager with Pfaff & Kendall.

Whitlow-Briscoe Co., Dallas, Texas, has been made the northern and west Texas representative of The Kirlin Co., Detroit, Mich., according to a recent announcement.

Theodore L. Etherington has been appointed manager-advance engineering at General Electric's Outdoor Lighting Department. Mr. Etherington succeeds **R. K. Drake** (M) who has been appointed to the newly created post of manager-area and specialty lighting engineering.

Dr. John V. Grimaldi, consultant, General Electric Co., New York, was elected president of the American Society of Safety Engineers at the society's annual meeting. Others elected were **Michael F. Biancardi,** manager of safety services, Allis-Chalmers Manufacturing Co., Milwaukee, first vice-president; **Edwin B. Locke,** manager engineering department, Texas Employers Insurance Association, Dallas, second vice-president; **A. C. Blackman,** managing director, American Society of Safety Engineers, Chicago, secretary; and **Frank E. Laderer,** director of safety, Nationwide Insurance, Columbus, treasurer. Three newly elected members-at-large to the Executive

(Continued on page 36A)

1962 Conference Paper Outlines Due January 31

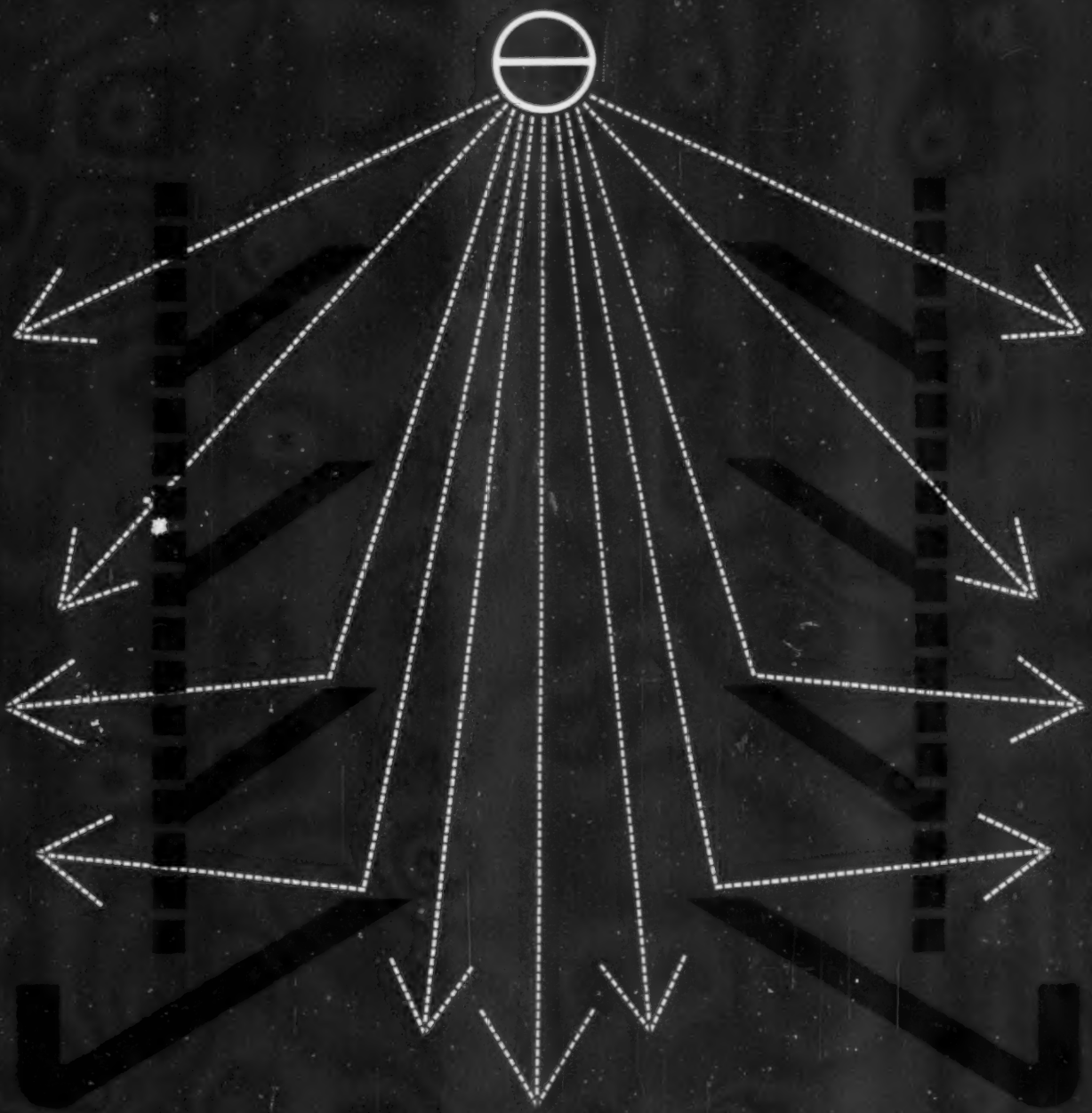
The IES Papers Committee announces that outlines of proposed papers for the 1962 National Technical Conference in Dallas must be submmitted by January 31, 1962. All submissions should make clear the intended scope of the paper and indicate features of the work that will justify its presentation and publication. Outlines should be sent to:

Benjamin S. Benson, Jr.
Chairman, IES Papers Committee
Benjamin Division, Thomas Industries, Inc.
Des Plaines, Ill.

MULTICONE BAFFLE One of many innovations in our new Marco collection. Diagonal baffles, plus a perforated casing, trap light beams bouncing off sides of reflector. Results: glare cut to absolute minimum. Write for handsome catalog illustrating over 100 new recessed incandescent lighting fixtures.

MARCO

MARVIN ELECTRIC MANUFACTURING COMPANY, Dept. IE11, 643 Santa Fe Ave., Los Angeles 21, California



Installations in the News . . .

Aluminum Foil Used for Lighting Plenums

Unusual lighting plenums, made from a foil-faced reinforced paper, developed originally as a fire-resistant vapor barrier, have been used in the illumination system of the new Poniatoff Building in West Palo Alto, Calif. The foil-faced plenums, which have an 85 per cent reflection factor, are either stapled or cemented to ceiling boards and taped to the perimeter T-bars of the diffusing panel support system. Fixtures and panel framework are hung from the underside of the roof at four-foot intervals, by strands of 12-gauge wire.

Each of the luminous panel sections in the high-ceilinged area of the drafting room shown at right is equipped with continuous rows of F96T12 slimline lamps mounted on one-foot centers. Along the underside of air conditioning ducts, two- by four-foot surface mounted fixtures, each housing two rapid-start lamps, are installed in conventional plenums. Lighting level in the completed office area is 120 footcandles.

Photos and data courtesy of American Light and Ceiling Co., San Francisco, Calif.

(*Continued from page* 34A)

Committee are: **Holly P. Bradley,** supervisor of safety Service Pipe Line Co., Tulsa; **Lee B. Johnson,** chief safety engineer, Norair Division, Northrop Corp., Hawthorne, Calif.; and **W. Eugene Stuffing,** director of safety, Carrier Corp., Syracuse.

Union Carbide Plastics Co., Division of Union Carbide Corp., New York, has announced the selection of **John R. Peterson** as office manager of the Cleveland district sales office.

Reynolds Metals Co., Richmond, Va., has announced the selection of **Harold O. Catherman** as electrical distributor coordinator. Prior to his appointment Mr. Catherman was branch manager for Westinghouse Electric Supply Co., at Johnstown, Pa., and Wilmington, Del.

Edward J. Bennan (M), president of Jefferson Electric Co., Bellwood, Ill., has announced the retirement of **Victor E. Lee** from the post of secretary and assistant treasurer, after 38 years of service. Also, at Jefferson, former marketing service manager, **Alason H. Franking,** has been named director of the newly created business development department, and **William D. Hamel** (A) has been appointed as distributor sales manager.

Crouse-Hinds Co., Syracuse, N. Y., has announced three changes in its marketing division. **Arthur F. Uhrlandt** was appointed to the newly created post of marketing director. Succeeding Mr. Uhrlandt as sales director will be **F. William Oberle** who was northeast division manager. **Gordon V. Miller,** most recently Atlanta division manager, will fill Mr. Oberle's post.

William O. Malone has been appointed as technical representative in the south Atlantic sales region of Union Carbide Plastics Co., Division of Union Carbide Corp., New York. According to **V. L. Larson,** regional sales manager, he will locate at Greensboro, N. C.

According to Morton D. Semel, vice-president of Omega Lighting, Inc., New York, **Lou Goren** and **Ira Newman** will be Omega's New York sales engineers.

Jerrold R. Bucher has been appointed western district sales manager by the Technical Products Division of Corning Glass Works, Corning, N. Y. He will be located in Anaheim, Calif. Mr. Bucher has been assistant manager of the Laboratory Glassware Marketing Department. Also appointed by Corning Glass was **William T. Cahill** as product specialist in lamp parts for the Lighting Glassware Marketing Department.

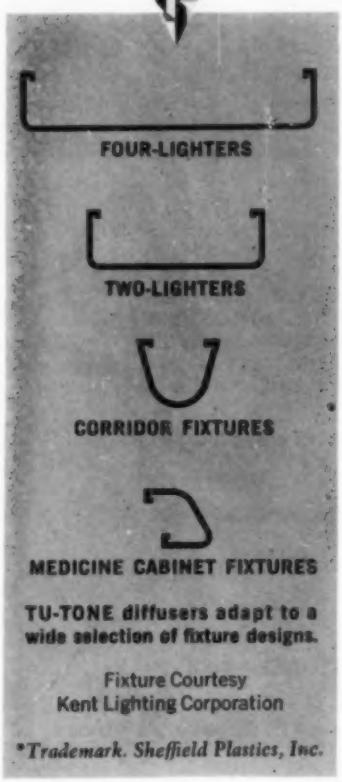
Edward J. Caspers, Jr., president, Chicago Guardian Light Co., Oak Park, Ill., has announced the appointment of **James T. Monroe** as Chicago marketing manager. Previously, Mr. Monroe was sales representative with the Revere Electric Manufacturing Co.

Sylvania Electric Products Inc., has announced several changes. **H. L. Simmers** was appointed sales manager of the Pittsburgh district of the Lighting Products Division. Mr. Simmers succeeds **H. Page Woodbury** (A) who has been made Philadelphia district sales manager. **E. Barry Colby** (M) has been named mar-

(*Continued on page* 39A)

THESE DIAMONDS GIVE YOUR FIXTURE BRIGHT NEW STYLING, HIGH EFFICIENCY TOO

Full Size



TU-TONE diffusers adapt to a wide selection of fixture designs.

Fixture Courtesy
Kent Lighting Corporation

**Trademark. Sheffield Plastics, Inc.*

Sheffield Tu-Tone extruded styrene diffusers offer new diamond prisms on bottom, plus ever-popular white translucent sidewalls.

You put the selling power of brand new styling in your fixture designs when you specify this latest Sheffield Tu-Tone diffuser. Its clear diamond prismatic bottom keeps fixtures right in step with the current trend.

The new diamonds offer high lighting efficiency as well. Excellent cutoff is obtained both lengthwise and crosswise of the fixture.

In addition, Tu-Tone retains its white translucent sidewalls, providing soft, even lighting to the side and a pleasing two-color effect.

Directo-Lite Prisms Also Available

Tu-Tone is also furnished with Directo-Lite longitudinal prisms, with or without crosshatching. And the flexibility of the Tu-Tone manufacturing process makes it suitable for a variety of fixture designs and shapes.

Tu-Tone, like all Sheffield diffusers, is custom-designed only. You can achieve attractive shapes which will be exclusive with your fixture.

If you would like further information on TU-TONE* or other popular Sheffield extrusions for lighting — Directo-Lite*, Frost-White-X*, and SL* prismatic lenses — write Sheffield Plastics, Inc., Dept. 15B, Sheffield, Mass.

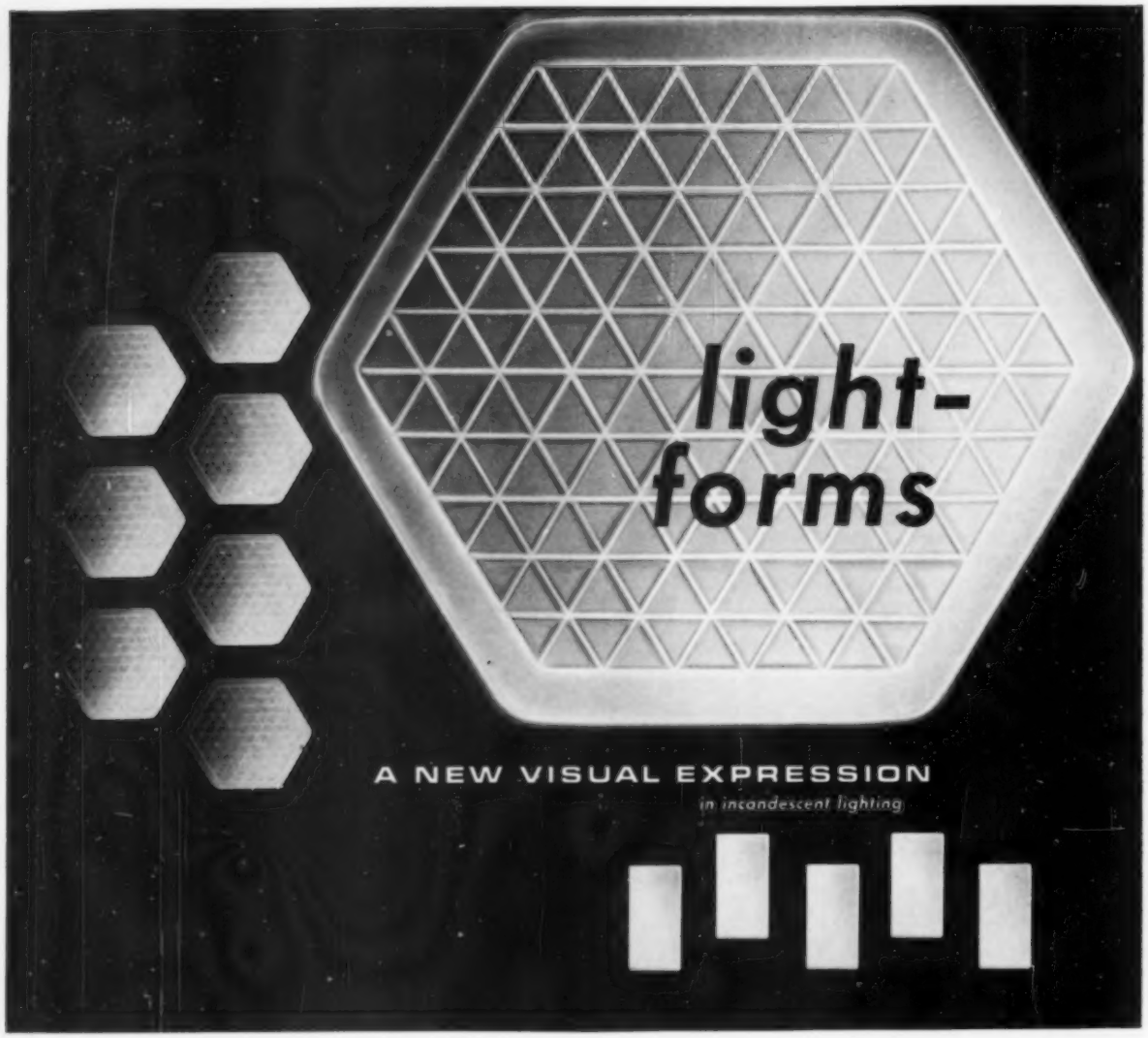
First in Plastics for Lighting

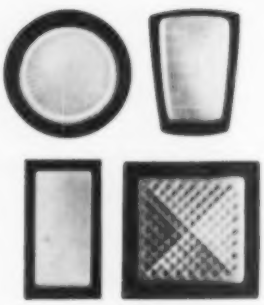
SHEFFIELD PLASTICS, INC.

SHEFFIELD, MASS.

SALES OFFICES

New York, N.Y. LO 8-3760 • Drexel Hill, Philadelphia, MA 6-4762
Chicago: Bill Brown Sales Co., Inc. IR 8-8980 • San Francisco: Courtney Associates JU 5-5010





Glowing geometric shapes combine the beauty of soft satin handblown glass with all-aluminum construction to provide an unusual combination of decorative effects limited only by the imagination of the designer. ***light-forms*** can be used individually or in combinations of alignment to create patterns of light that become an integral part of the architecture.

Designed for wall use only, ***light-forms*** may be used on either interiors or exteriors.

PATS. APPLIED FOR

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PRESCOLITE MANUFACTURING CORPORATION
2229 Fourth Street, Berkeley 10, California
FACTORIES: Berkeley, California • Warrington, Pennsylvania • El Dorado, Arkansas

(*Continued from page 36A*)

keting manager, industrial commercial sales, for the same division, replacing **Chalmer J. Carothers, Jr.** (A), who has resigned. Also announced by Sylvania was the appointment of Industrial Devices, Inc., Edgewater, N. J., as a master distributor for their line of electronic indicator lamps.

The appointment of **George J. Kennedy** (A) to the post of general sales manager of Day-Brite Lighting, Inc., St. Louis, Mo., has been announced. He previously served as the company's eastern sales regional manager and coordinator of national accounts. In his new position Mr. Kennedy will be headquartered at the company's main offices located in Clayton, Mo.

1962 IES Regional Conferences

Region	Date and Place	Chairman
East Central	April 9-10 Traylor Hotel Allentown, Pa.	P. H. Hildebrand Pennsylvania Power & Light Co. 9th & Hamilton Sts. Allentown, Pa.
Southeastern/ South Central	April 12-13 King Edwards Hotel Jackson, Miss.	B. M. Davis Mississippi Power & Light Co. Jackson, Miss.
Great Lakes	April 16-17 Dayton Biltmore Hotel Dayton, Ohio.	Ivar Holmer Dayton Power & Light Co. 25 N. Main St. Dayton, Ohio.
Midwest/ North Central	May 10-11 Radisson Hotel Minneapolis, Minn.	Harry Spell Northern States Power Co. 15 S. 5th St. Minneapolis, Minn.
Canadian	May 14-15 Winnipeg, Man.	V. Stuart Buckler Green, Blankstein, Russell & Associates 222 Osborne North Winnipeg, Man.
Pacific Northwest	May 17-18 Davenport Hotel Spokane, Wash.	Ray Rookey Washington Water & Power Co. W. 825 Trent Spokane, Wash. Ted W. Beadle P. O. Box 1445 Spokane, Wash.
South Pacific Coast	May 21-22 U. S. Grant Hotel San Diego, Calif.	Alan J. McCutcheon, Jr. San Diego Gas & Electric Co. 861 6th Ave. San Diego, Calif. Ralph Rohrbach Pacific Wholesale Electric Co. 711 Union San Diego, Calif.
Inter-Mountain	May 24-25 Western Skies Hotel Albuquerque, N. M.	Albert W. Boehning, Jr. 1843 Lomas Blvd., N. E. Albuquerque, N. M. Stanley D. Johnston General Electric Co. 9646 Towner N. E. Albuquerque, N. M.
Northeastern	June 11-12 Hotel U. S. Thayer West Point, N. Y.	G. G. Rae Holophane Co. Inc. 342 Madison Ave. New York 17, N. Y.

Henry Gluck (A), vice-president of sales, Sunbeam Lighting Co., Los Angeles and Gary, Ind., has announced three new appointments. **Judd Kaye** will cover northern New Jersey sales, **Reid Trapani,** Georgia and the eastern half of Tennessee, and **C. B. Young** (A), Arkansas and Memphis, Tenn.

C. W. Carr (A), representative of Wakefield and Art Metal Lighting Divisions of Wakefield Corp., Vermilion, Ohio, has announced the appointment of **Gordon F. Goerman** as his associate. Mr. Goerman formerly had been in lighting sales with Doubleday-Hill Electric Co. C. W. Carr Associates will be located in Pittsburgh, Pa.

Deaths

C. F. Daugherty, Indiana Section
Arthur C. Downes, Cleveland Section
Sidney A. Furniss, San Diego Section
Thomas L. Holbrook, Michigan Section
Clifford L. Justesen, New Jersey Section
Thomas R. Lyda, Indiana Section
H. E. Mahan, Eastern New York Section
S. J. Makuh, Illini Chapter
James Posey, Maryland Section
Howard L. Powell, New England Section
James H. Rylance, Toronto Section
G. E. Wilkinson, Tar Heel Section
J. F. Williams, Miami Valley Section

BOOKS AND PAMPHLETS

Computer Handbook, edited by Harry D. Huskey and Granino A. Korn, available from McGraw-Hill Handbook Series, New York. 1228 pp., 1099 ill. $25.

Here is a comprehensive reference book covering analog and digital computers and systems, and their application to science and engineering, from basic terminology to most recent technical advances. Detailed technical information and many circuit diagrams useful in design work are included.

The analog computer section presents modern design practice from general- to special-purpose machines and a comprehensive review of applications and methodology. There are sections on electric-analog-computer building blocks, techniques of dynamic storage computation, and solid-state (transistor) analog computer components.

(*Continued on page 40A*)

(*Continued from page 39A*)

The digital section ranges from component and computing circuits (flip-flops, gates, pulse shapers, memory devices), arithmetic units, design, programming, and digital computer system design, to recent advances such as amplifier and multiplier circuits, and automatic iterative programming.

Christmas Greetings With Light, Booklet S-696, edited by Myrtle Fahsbender, available in quantity price lots from Westinghouse Lamp Division, Westinghouse Electric Corporation, Bloomfield, N. J.

New and attractive lighting designs for indoor and outdoor Christmas decorations, equally adaptable for home or apartment, are illlustrated in this booklet. Other sections explain safety in outdoor lighting and tree trimming, including a chart for number of lights per length of tree. Interspersed throughout the booklet are short synopses of Christmas customs in other lands.

Up to 499 copies	$5.00/100
500 copies or more	$3.50/100

Statistical Year Book of the Electric Utilities Industry for 1960, available from the Edison Electric Institute, 750 Third Ave., New York 17, N. Y., 70 pp., single copy $1.50.

The 1960 edition of the annual review of the electrical utility industry's activities is now available. Statistical data are divided into nine sections covering generating capacity, generation, energy sales, customers, revenues, operating data and ratios, finance and economics. Separate figures for the total industry, the investor-owned and the privately-owned utilities are presented in the 61 tables and numerous charts. Also included in each section is a discussion of trends and indications at end of the year's activities.

Glossary of Electric Utility Terms, 84 pp., 50 cents per copy, and **Nuclear Supplement to the Glossary of Electric Utility Terms,** 16 pp., 25 cents per copy, available from the Edison Electric Institute, 750 Third Ave., New York 17, N. Y. Quantity prices may be requested.

Both booklets are helpful reference pieces for use in the interpretation and presentation of electrical utility industry statistical reports. The glossary, a revision of the 1956 edition, contains definitions of some 400 financial and technical terms. The nuclear supplement defines some 80 terms relating to the electric industry's nuclear development programs, many of which are listed in the 1961 Federal Power Commission Uniform System of Accounts.

Research in Road Safety, available from the Organization for European Economic Cooperation, Directorate for Scientific Affairs, 2, rue André-Pascal, Paris 16e, France, 54 pp.

This report of the first meeting of the Organization for European Economic Cooperation's Road Research Laboratory which met in Langley, England, includes several interesting research papers on factors which influence the number and severity of auto accidents.

Among them are "The Investigation on Crash Injury Prevention in Sweden," "The Work of the U. S. Aero-Medical Laboratory on Crash Forces and Injuries," "Injuries in Relation to Vehicle Design," "The Development of Crash Helmets," and "Research on Alcohol and Driving."

Westinghouse Mercury Lights Philadelphia, B-8230, available from Westinghouse Lighting Division, Edgewater Park, Cleveland, Ohio, 16 pp.

Results of Philadelphia's urban relighting program, in accordance with IES lighting standards, are pictorially presented in this booklet. Philadelphia pioneered in the use of 700-watt, 3600-lumen, mercury luminaires for street lighting. Application details for expressways, thoroughfares, interchanges, drives, shopping centers and residential areas throughout the city accompany the illustrations.

NEW MEMBERS

The following were elected to membership by action of the IES Council on October 18, 1961. *indicates transfer from Associate Member grade; **indicates transfer from Student Member grade.

CANADIAN REGION

Bluenose Chapter

No Elections

Forest City (London) Chapter

No Elections

Golden West Chapter

Associate Members:

Fraser, A. L., Saskatchewan Power Corp., Regina, Sask.

Scott, P., Saskatchewan Power Corp., Regina, Sask.

Hamilton Ontario Chapter

Associate Member:

Verity, M. F., Crown Electrical Manufacturing Ltd., Brantford, Ont.

Maritime Chapter

No Elections

Montreal Section

Members:

*Beaudet, J. H., The Shawinigan Water & Power Co., Montreal, P. Q.

*Cristel, J. P. R., The Shawinigan Water & Power Co., Montreal, P. Q.

Northumberland Chapter

No Elections

Ottawa Section

No Elections

Quebec Chapter

No Elections

St. Maurice Valley Chapter

No Elections

Toronto Section

Associate Member:

Johnston, R. A., John H. Ross & Associates, Consulting Engineers, Toronto, Ont.

Student Member:

Dillon, W. M., Queens University, Faculty of Applied Science in Electrical Engineering, Kingston, Ont.

Winnipeg Chapter

No Elections

EAST CENTRAL REGION

Blue Ridge Chapter

Member:

Hively, R. H., Appalachian Power Co., Roanoke, Va.

Associate Members:

Barbour, P. G., Noland Co., Inc., Roanoke, Va.
Blair, J. M., J. M. Blair Co., Roanoke, Va.
Candler, D. B., Mid-State Electrical Supply Co., Inc., Lynchburg, Va.
Clingenpeel, O. F., Westinghouse Electric Supply Co., Roanoke, Va.
Connor, M. E., General Electric Supply Co., Roanoke, Va.
Falligant, R. E., Noland Co., Inc., Roanoke, Va.
Ford, W. W., Jr., Appalachian Power Co., Roanoke, Va.
Hartman, P. A., Appalachian Power Co., Roanoke, Va.
Mayes, W. D., Westinghouse Electric Corp., Roanoke, Va.
McCraw, J. E., Bemis Electric Distributing Corp., Roanoke, Va.
McGhee, L. M., Mid-State Electrical Supply Co., Inc., Lynchburg, Va.
Mills, R. L., Appalachian Power Co., Roanoke, Va.
Muncey, J. I., Appalachian Power Co., Roanoke, Va.
Sanderson, R. T., Graybar Electric Co., Roanoke, Va.
Tinnell, C. G., Clayton G. Tinnell Electrical Contractor, Roanoke, Va.
Wright, T. W., City of Martinsville, Martinsville, Va.

Capital Section

Member:

Mullis, W. F., National Bureau of Standards, Washington, D. C.

Associate Member:

Dhers, P. J., Northeast Electric Co., Washington, D. C.

Eastern Pennsylvania Section

No Elections

Maryland Section

No Elections

Philadelphia Section

Member:

*Phillips, C. B., Aviation Research & Development Landing System Section, Airport Lighting Unit, Atlantic City, N. J.

Pittsburgh Section

No Elections

Virginia Section

No Elections

(*Continued on page 56A*)

LOOK INTO SPAULDING FOR TOMORROW'S LIGHTING TODAY

You will find in the J. H. SPAULDING outdoor lighting catalog the finest outdoor lighting equipment made today. The J. H. SPAULDING company proudly offers a complete line of fluorescent, mercury vapor and incandescent fixtures, plus a complete line of poles and equipment. So why not fill out the coupon and get tomorrow's outdoor lighting today.

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DESIGNERS OF AMERICA'S MOST DISTINCTIVE OUTDOOR LIGHTING

Take the SURGE out of mercury-lamp starting

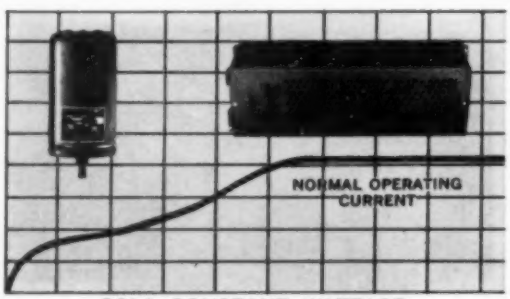
WITH SOLA CONSTANT-WATTAGE BALLASTS

Full rated lamp life . . . more lamps per circuit . . . less costly wiring: These across-the-board SOLA savings reduce installation costs, assure longer lamp life expectancy and less maintenance. And all are direct results of SOLA constant-wattage mercury-lamp ballast design!

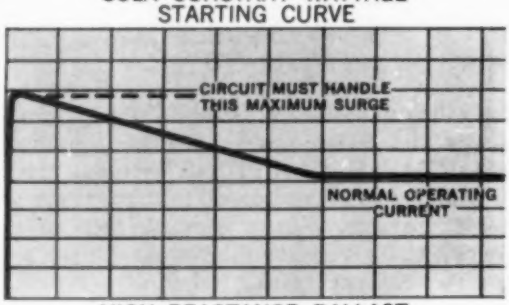
Self-limiting action of constant wattage ballasts takes power-surges out of lamp starting, automatically compensates for line fluctuations. Parallel 2-lamp models operate lamps independently of each other and keep good lamp shining steadily even after mate burns out. Complete range of types for indoor as well as outdoor applications.

SOLA *constant-wattage* holds lumen output within ±1% for line-voltage changes as great as ±13%. "Drop-out" is virtually nil, since input voltage must fall *30% below nominal* before lamp extinguishes. SOLA M-L ballasts are also inherently self-protecting against open and shorted lamps.

Available for 115, 208, 230, 277, 460 and 575-volt input. Get full details from your SOLA supplier, or write us for information, specifying M-L indoor or outdoor type ballast.



SOLA CONSTANT WATTAGE STARTING CURVE



HIGH-REACTANCE BALLAST STARTING CURVE

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A DIVISION OF BPC BASIC PRODUCTS CORPORATION

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COMMITTEE PERSONNEL

COMMITTEES
1961-1962

All committees are appointed by the President, subject to approval of the Council. Except as provided in the Constitution, appointments terminate at the time of the first Council meeting of the following administration. The scope of each committee is indicated.

J. R. Chambers, President, ex-officio member of all Standing, General and Task Committees, except Board of Fellows, Board of Nomination and Medal Award Committee.

G. F. Dean, Vice-President, ex-officio member of all Technical Committees (by appointment).

STANDING COMMITTEES

COUNCIL EXECUTIVE—To conduct the affairs of the Society between Council meetings.

J. R. Chambers, Chairman, Appleton Electric Co., 1701-1759 Wellington Ave., Chicago 13, Ill.

C. L. Amick — G. F. Dean
A. C. Barr — J. D. Mitchell

BOARD OF FELLOWS—To evaluate the eligibility of candidates for transfer to the grade of Fellow, according to procedures approved by Council.

L. E. Barbrow, Chairman, National Bureau of Standards, Washington 25, D. C.

H. F. Davidson — C. H. Rex
W. E. Folsom — George Wakefield
R. M. Zabel

FINANCE—To have direct supervision of the financial affairs of the Society and to present to the Council an annual report on its financial condition. To make recommendations to the Council as to the investment of monies and upon all specific appropriations. To prepare and submit for approval of Council not later than the first new Council meeting a budget of income and expense for the ensuing fiscal year.

A. C. Barr, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

H. S. Beagle — C. C. Shotwell
W. P. Lowell, Jr. — J. C. Wilson
Max D. Orr — R. M. Zabel

GENERAL BOARD OF EXAMINERS—To investigate the qualifications of all applicants for admission to membership; to elect or reject applicants for the grade of Associate Member and Student Member, to report such action to the Council; and to make recommendations to the Council regarding applications for transfer or election to the grade of Member or Retired Member, and for transfer to the grade of Member Emeritus.

Tayler Barr, Chairman, P. O. Box 424, R. D. #2, Hopewell Junction, N. Y.

Clarence W. Clarkson — Edward O. Kassman
F. C. Breckenridge — J. William Griffith
James Cox — J. S. Hamel
C. M. Cutler — J. N. Robertson
H. F. Davidson — Roy A. Palmer
Kurt Franck — T. C. Sargent
O. B. Goldsmith — Floyd W. Sell
G. A. Trosper

PAPERS—To procure, review and approve all technical papers and discussions thereof, for presentation before National Conference of the Society.

B. S. Benson, Jr., Chairman, Benjamin Division, Thomas Industries, Inc., Des Plaines, Ill.

George Wakefield, Vice-Chairman, Wakefield Corp., Vermilion, Ohio.

PUBLICATIONS—To be responsible for the procurement, review and approval of all material for the publications of the Society other than technical papers approved by the Papers Committee for presentation at National Conferences of the Society and their discussions and committee reports, for which it will have publication responsibility only. Shall also be responsible for the editing, printing and business management of the publications of the Society; specific exceptions may be made by Council.

R. W. Morris, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

Theodore Ake — Brooks Chassaing
C. L. Amick — Ernest Gallet
B. S. Benson, Jr. — Arthur R. Jaeger
W. P. Lowell, Jr.

Residential Lighting Data Sheets

Elizabeth A. Meehan, Chairman, Philadelphia Electric Co., 211 S. Broad St., Philadelphia, Pa.

Lighting Data Sheets (Commercial, Industrial)

Arthur R. Jaeger, Chairman, Corning Glass Works, Corning, N. Y.

GENERAL COMMITTEES

ADVANCE PLANNING—To study the long range objectives of the Society—its operation, program, publication activities, membership classifications and financial structure, and to make recommendations to Council.

C. W. McCormick, Chairman, Connecticut Light & Power Co., P. O. Box 2010, Hartford, Conn.

John M. Chorlton, Vice-Chairman, Toronto Board of Education, 155 College St., Toronto 2B, Ont.

J. J. Neidhart — Beverly Travis
Joseph Thomas — L. C. Twichell
J. D. Whitnell

ALLIED ARTS—To encourage and assist local competitions in allied arts, in cooperation with technical committees and interested local groups.

R. W. Brown, Chairman, Cincinnati Gas & Electric Co., Cincinnati, Ohio.

Carl Albach — L. T. Kight
Marion G. Currie — W. M. C. Lam
Roy Dahlin — Edward Rambusch
C. D. Gill — Wilbur D. Riddle
W. A. Hedrich — Joel E. Rubin
George F. Herold — John A. Russell
J. D. Whitnell

APPLIED LIGHTING COMPETITION—To encourage and assist local and regional competitions and to conduct the national competition during the National Technical Conference, in accordance with procedure approved by the Council.

Raymond L. Smart, Chairman, Boston Edison Co., 39 Boylston St., Boston 12, Mass.

Carl Allen — Edna Fortier
A. C. Brodeur — H. J. Gruber
Rose M. Coakley — J. W. Hamilton
J. T. Cottingham — C. D. Miller
Lloyd Durfee, Jr. — Harry Nellis

BOARD OF NOMINATION—To prepare a nomination ticket containing the names of those who are deemed best suited to serve as officers and directors in positions to be filled at the ensuing election.

G. J. Taylor, Chairman, Day-Brite Lighting Inc., 212 South Central, Clayton 5, Mo.

J. B. Browder — R. G. Slauer
and regional representatives

CONSTITUTION AND PROCEDURES — To prepare proposed amendments to the Constitution and By-laws, to prepare statements of policies and procedures consistent with the Constitution and By-laws, and to report to Council.

L. C. Twichell, Chairman, Rochester Gas & Electric Corp., 89 East Ave., Rochester, N. Y.

G. F. Dean — Raymond L. Smart
Joseph Thomas — M. N. Waterman

MEDAL AWARD—To evaluate the eligibility of candidates for award of the IES Medal according to procedures approved by the Council.

Edward Rambusch, Chairman, Rambusch Decorating Co., 40 W. 13th St., New York 11, N.Y.

J. W. Bateman — W. F. Little
J. W. Barker — G. E. Shoemaker
J. B. Browder — R. G. Slauer
Ward Harrison — G. J. Taylor

MEMBERSHIP—To develop plans and supervise the operation of the individual membership activity of the Society.

George W. Clark, Chairman, Sylvania Electric Products Inc., One 48th St., Wheeling, W. Va.

A. C. Brodeur — J. M. Gensburger
R. D. Churchill — B. J. Hartmann
J. F. Finn — R. M. Taylor

NATIONAL TECHNICAL CONFERENCE — To be completely responsible, subject to the approval of Council, for the general coordination of all conference activities, for selecting and recommending time and place, for review of the plans and budgets of the National Technical Conference Executive Committee, and in cooperation with the Papers Committee for the satisfactory time allocation for the technical papers sessions, according to Procedures and Policies as adopted by Council.

Brooks Chassaing, Chairman, Chassaing Lighting, Inc., 7601 Forsyth Blvd., Clayton 5, Mo.

C. L. Amick — P. M. Rutherford
A. C. Barr — J. J. Smith
B. S. Benson — L. E. Tayler
H. G. Clum — R. G. Turpin
R. T. Dorsey — J. C. Wilson
Alston Rodgers — F. E. Yanaros

(*Continued on page 44A*)

(*Continued from page* 43A)

PUBLIC RELATIONS AND INFORMATION—To prepare and disseminate information about the activities, accomplishments, programs, objectives and policies of the Society and about the place of illuminating engineering in modern society; to formulate and submit public relations policies and plans to the Society.

Gordon Wells, Chairman, Day-Brite Lighting, Inc., 5411 Bulwer Ave., St. Louis 7, Mo.

Vernon T. Kempf, Vice-Chairman, *Plant Engineering* Magazine, 308 East James St., Barrington, Ill.

J. B. Bailey	R. E. Harz
F. L. Engle	R. W. Sclater

REGIONAL ACTIVITIES—To represent the respective Regions before the Council and to keep the Council informed regarding the affairs of the Regions. To stimulate Society activities, to encourage joint meetings of Sections and Chapters including Regional Conferences within the respective Regions, and to promote the expansion of the Society.

J. D. Mitchell, Chairman, Westinghouse Lamp Division, 5071 Peachtree Industrial Blvd., Chamblee, Ga.

J. P. Cristel	J. S. Ragland
T. L. Cordle	A. Rodgers
J. T. Cottingham	R. M. Smart
R. D. Cohen	R. G. Turpin
R. Godemann	J. S. Williams
R. H. Kreyser	R. L. Zahour

RESIDENCE LIGHTING FORUMS—To stimulate and assist the Residence Lighting Forums of the Society and to encourage the formation of additional forums. To conduct a Residence Lighting Forum in connection with the National Technical Conference.

Aileen Page, Chairman, General Electric Co., Nela Park, Cleevland 12, Ohio.

John A. Sahlman, Vice-Chairman, Public Service Electric & Gas Co., 80 Park Place, Newark, N. J.

Emily Alexander	Virginia Skinner
Rose M. Coakley	Jack Thompson
Myrtle Fahsbender	Mary Wallace

SUSTAINING MEMBERSHIP — To develop plans and supervise the operation of the Sustaining Membership activity in the Society according to the Procedures and Policies adopted by Council.

B. F. Benning, Chairman, Graybar Electric Co., Inc., 420 Lexington Ave., New York, N. Y.

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J. R. Bailey	J. J. McLaughlin
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R. G. Slauer

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ON EDUCATIONAL AND PROFESSIONAL STANDARDS—To study the trend in educational and professional standards for illuminating engineering (including methods for achieving these), consulting with related committees (Education, Membership, Advance Planning), and to prepare recommendations for report to Council.

C. L. Amick, Chairman, Day-Brite Lighting Inc., P. O. Box 141, St. Louis 66, Mo.

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AVIATION—To study the application of light and lighting to the spaces and functions involved in the operation of aircraft.

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L. W. Hornfeck, Vice-Chairman, 711 Penn Ave. Bldg., Pittsburgh 22, Pa.

John P. Hoxie, Recording Secretary (Program Coordinator), Product Engineering Dept., Corning Glass Works, Corning, N. Y.

Victor Converso, Corresponding Secretary, Aviation Planning Division, Port of N. Y. Authority, 111 8th Ave., New York, N. Y.

H. W. Wenson, Treasurer, Port of N. Y. Authority, 111 8th Ave., New York 11, N. Y.

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T. H. Projector — E. R. Tindle

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COLOR—To study, evaluate and report on the effect of color in relation to the art and science of illumination.

R. C. Allison, Chairman, Engineering and Design Dept., The T. Eaton Co., Ltd., 190 Yonge St., Toronto 1, Ont.

W. E. Carswell — G. F. Dean

DAYLIGHTING—To study the problems involved in daylighting, develop recommended practices and report thereon.

J. W. Griffith, Chairman, Southern Methodist University, Industrial Engineering Dept., Dallas, Texas.

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J. J. Kemendo	K. C. Welch
R. C. Kendall	O. F. Wenzler
M. W. Keyes	C. J. Youngblood

DESIGN PRACTICE—To study published data on coefficients of utilization, room indexes, maintenance coefficients and other elements entering into calculations for lighting design; develop standard methods for use in Society publications and report thereon.

Bill F. Jones, Chairman, Smoot-Holman Co., Box 4097, Inglewood, Calif.

Carl Allen	J. Roy Jones
Lloyd Durfee	R. C. LeVere
Ward Harrison	J. J. Neidhart

EDUCATION—To study and encourage lighting education and training for professional careers in schools, colleges and elsewhere; to prepare educational and training material on fundamental and advanced concepts of light and illumination, and to further its adoption in courses conducted by Sections and Chapters.

P. H. Hildebrand, Chairman, Pennsylvania Power & Light Co., 9th and Hamilton Sts., Allentown, Pa.

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O. P. Cleaver	R. C. Putnam
Marion G. Currie	Alston Rodgers
E. L. Fairchild	T. H. Shepherd
George Gill	W. Sturrock
J. W. Griffith	W. Weibel
W. A. Hedrich	I. A. Yost

C. W. Zersen

Brochure on "Opportunities in Illuminating Engineering"

J. L. Tugman, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

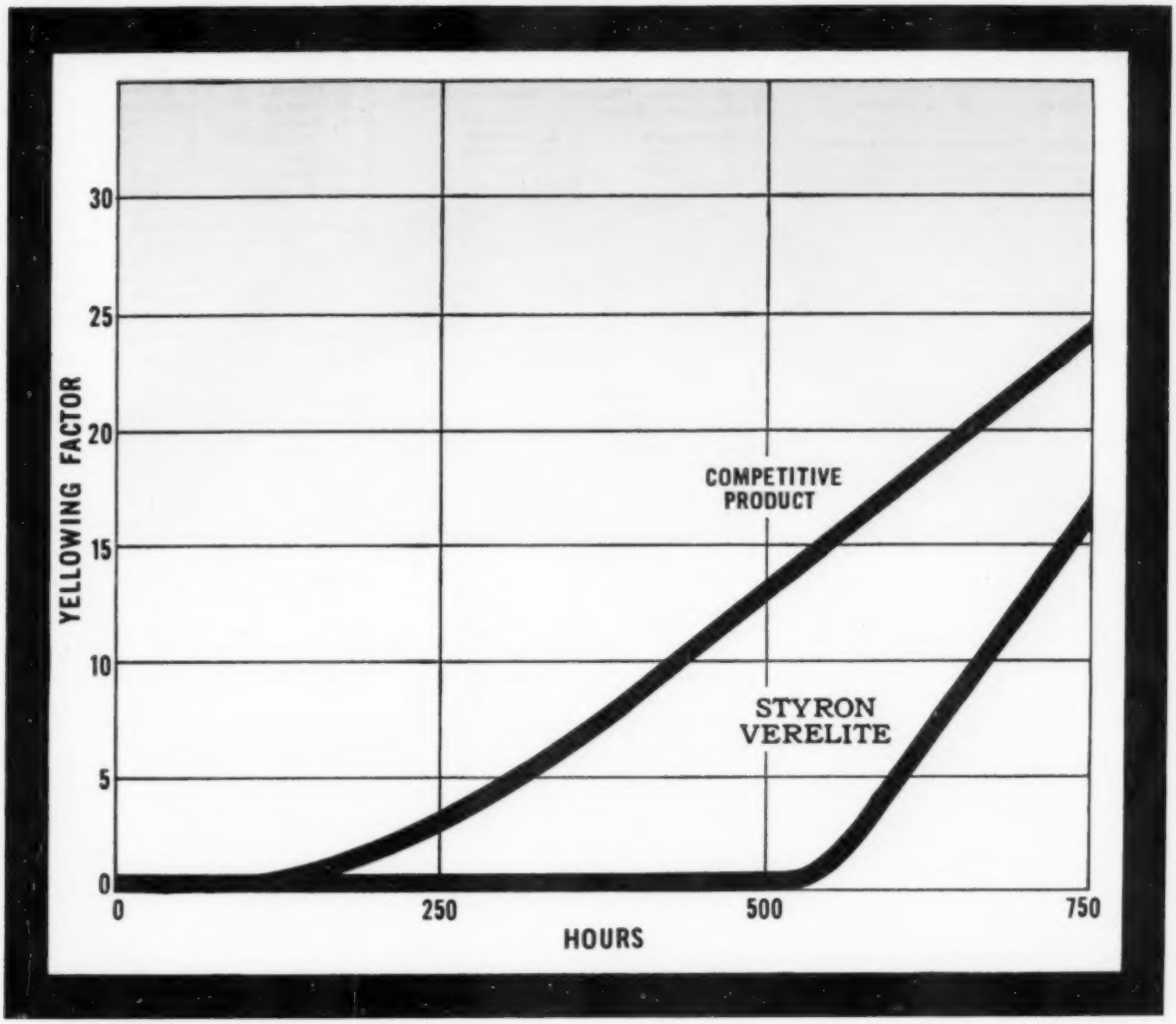
R. C. Putnam

Revision of "Advanced Lighting Design Problems Course"

R. R. Lusk, Chairman, Commonwealth Edison Co., 7601 S. Lawndale Ave., Chicago 29, Ill.

J. F. Parsons

(*Continued on page* 46A)



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(*Continued from page 44A*)

Science Textbook Review

J. L. Tugman, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

E. L. Fairchild — W. A. Hedrich

HANDBOOK—To have continuous responsibility for appraising the service rendered by the Handbook, for its accuracy and improvement; to advise Council when revisions and new editions are needed. To revise and arrange the technical content of the Handbook; to lay out, plan, and arrange for development of individual sections primarily through appropriate technical committees, to consult with the Publications Committee on its presentation of a suitable publication budget for Council approval; to be responsible to Council for the format, accuracy, and treatment of material.

R. D. Bradley, Chairman, Day-Brite Lighting, Inc., P.O. Box 141, St. Louis 66, Mo.

J. J. Neidhart — M. N. Waterman

INDUSTRIAL—To initiate, follow up and coordinate lighting study projects in the industrial field, review the reports of the various subcommittees in this field and make recommendations to Council.

L. G. Parks, Chairman, Ebasco Services, Inc., 2 Rector St., New York, N. Y.

INSTITUTIONS—To initiate, follow up and coordinate lighting study projects in the field of public buildings and private institutions, review the reports of the various study subcommittees in this field and make recommendations to Council.

Leo Dolkart, Chairman, 222 E. Chestnut St., Chicago 11, Ill.

Church Lighting

George Shoemaker, Chairman, Philadelphia Electric Co., 211 S. Broad St., Philadelphia 5, Pa.

John Adams — T. N. Mansell
A. L. Bleecker — H. W. Olsen
A. C. Sangster

Hospital Lighting

Noyce L. Griffin, Chairman, Department of Health, Education and Welfare, Public Health Service, Division of Hospital and Medical Facilities, Washington 25, D. C.

JOINT LIGHTING SURVEY—(IES-U.S. Public Health Service)—To outline a method of making a survey of the visual factors of the working environment and the worker's vision and evaluating the findings in terms of visual comfort and effectiveness and eye health

J. F. Parsons, Chairman, Niagara Mohawk Power Corp., Electric Bldg., 535 Washington St., Buffalo 3, N. Y.

H. N. Doyle, Vice-Chairman, U. S. Public Health Service, Washington 25, D. C.

Tula Brocard — L. E. Duval, Jr.
L. J. Cahill — A. L. Koven
George Clayton — R. P. Teele

LIGHT CONTROL AND EQUIPMENT DESIGN—Collect and correlate the knowledge and data on means and methods of controlling, directing, reflecting, transmitting and diffusing light and on the principles and practices of equipment design.

Milton Buzan, Chairman, Day-Brite Lighting, Inc., 5411 Bulwer Ave., St. Louis, Mo.

Richard S. Hawes, III, Vice-Chairman, KSH Plastics, Inc., 10212 Manchester Rd., St. Louis 22, Mo.

W. S. Blitzer — E. A. Nelson
E. H. Church — J. N. Robertson
D. C. McCormack — M. E. Robertson
F. M. Neal — W. Weibel

IES-SPI-NEMA

Richard S. Hawes, III, Chairman, KSH Plastics, Inc., 10212 Manchester Rd., St. Louis 22, Mo.

LIGHT SOURCES—To correlate and report available information as to the physics of light and light production and the characteristics of current light sources.

E. F. Kelley, Chairman, Champion Lamp Works, Lynn, Mass.

H. A. Anderson — G. E. Davidson
L. E. Barbrow — George Freeman
W. E. Carpenter — D. S. Gustin
A. R. Chick — Walter Houston
R. D. Churchill — O. Leinhard
David Cutler — Paul Ries
M. E. Robertson

Color Rendition

Dorothy Nickerson, Chairman, 2039 New Hampshire Ave., N.W., Washington 9, D. C.

C. N. Clark — Norman Macbeth
George Freeman — G. R. Stillwell
C. W. Jerome — Luke Thorington
D. B. Judd — A. W. Weeks
Gunter Wyszecki

LIGHTING AND AIR CONDITIONING—To study the relationship between lighting and air conditioning, both with regard to integration of luminaires or lighting systems with heating and cooling requirements, and to their mutual effects on room environment.

W. S. Fisher, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

B. S. Benson, Jr. — M. L. Quin
G. Bonvallet — D. W. Rowten
Gershon Meckler — S. S. Squillace
G. E. Mulvey — Neil J. Thompson
H. T. Yopp

MAINTENANCE—To study the elements contributing to maintenance factors; set up the framework of typical field studies to determine factors; and to stimulate the prosecution of such studies by appropriate agencies.

Leo Duval, Chairman, Sylvania Electric Products Inc., 60 Boston St., Salem, Mass.

MERCHANDISING—To study the application of light and lighting to the spaces and processes involved in the selling of goods and to report thereon.

W. H. Kahler, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

C. W. Clarkson, Vice-Chairman, Corning Glass Works, 717 Fifth Ave., New York 22, N. Y.

Theodore Ake — L. N. Lamboy
L. H. Dickelman — A. Makulec
Norman Falk — N. J. Sonnenfeld
Lester Geis — K. C. Welch
Richard Kelly — Richard Wissoker

MOTOR VEHICLE (EXTERIOR)—To study the problems of illuminating the night operations of motor vehicles and to make suitable recommendations for promoting maximum safety and convenience including accessory illuminated signal and traffic aids.

R. P. Teele, Chairman, National Bureau of Standards, Washington 25, D. C.

Earl Allgaier — Charles Marsh
L. L. Beltz — H. C. Mead
H. S. Bull — R. I. Nagel
W. E. Carpenter — Karl Neulinger
L. W. Chubb, Jr. — S. C. Peek
D. M. Finch — E. R. Ricker
T. R. Kilgour — V. J. Roper
Roger Sachett

NOMENCLATURE—To define the terms and standards of illumination, and endeavor to obtain uniformity in nomenclature.

S. K. Guth, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

Abraham Abramowitz — D. M. Finch
E. Q. Adams — W. F. Little
L. E. Barbrow — Philip O'Brien
C. L. Cottrell — Priscilla Presbrey
Harris Reinhardt

OFFICE—To study the lighting requirements of office lighting tasks, develop suitable lighting recommendations and report thereon.

G. G. Rae, Chairman, Holophane Co., Inc., 342 Madison Ave., New York 17, N. Y.

A. S. Almryde — J. J. McLaughlin
C. L. Amick — C. W. McClelland
E. H. Church — J. J. Neidhart
C. W. Clarkson — Lorne Rittenberg
G. P. Dean — R. T. Waite
R. N. Edwards — G. P. Wakefield
W. S. Fisher — H. A. Williams
C. W. Macy — R. R. Wylie
R. W. McKinley — R. L. Zahour

PROGRESS—To keep in touch with developments in the art of lighting throughout the world and prepare a yearly review of achievements in the art of illuminating engineering for inclusion in ILLUMINATING ENGINEERING.

H. A. Williams, Chairman, Rohm & Haas Co., Washington Square, Philadelphia, Pa.

A. R. Jaeger, Vice-Chairman, Corning Glass Works, Corning, N. Y.

Theodore Ake — E. F. Kook
H. A. Anderson — L. Lamboy
Nelson Bleisch — E. C. Pauly
R. T. Dorsey — Harold Samuels
R. E. Faucett — T. C. Sargent
Herbert Fouke — S. M. Segal
John Gornet — M. K. Strang
R. E. Harz — R. P. Teele
R. F. Townsend

QUALITY AND QUANTITY OF ILLUMINATION, RECOMMENDATIONS FOR—To prepare recommendations of illumination levels, brightness limits and brightness relationships in form applicable to practices.

W. H. Kahler, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland 1, Ohio.

Willard Allphin — J. W. Griffith
R. D. Bradley — S. K. Guth
D. R. Brown — L. G. Parks
J. M. Chorlton — G. G. Rae
Leo Dolkart — E. M. Strong

RESIDENCE—To study and report on the application of light and lighting in residences; to develop performance recommendations for residence luminaires and to prepare necessary educational aids.

J. H. Jensen, Chairman, General Electric Co., Nela Park, Cleveland 12, Ohio.

Nelson Bleisch — W. F. Little
William Blitzer — Elizabeth A. Meehan
Rose Coakley — Jan Reynolds
Myrtle Fahsbender — S. R. Shemitz
Helen Gibbons — Mary B. Taepke
Benjamin Goodman — N. E. Wernert

ROADWAY—To establish the scientific principles underlying street and highway lighting; to collect data on the results of the application of such principles to actual practice; to prepare such reports thereon as will assist technicians and benefit the public.

Thomas J. Seburn, Chairman, Bureau of Highway Traffic, Strathcona Hall, Yale University, New Haven, Conn.

SCHOOL—To study the application of light and lighting to the spaces and processes involved in educational institutions and to report thereon.

J. M. Chorlton, Chairman, Board of Education, 155 College St., Toronto 2B, Ont.

Willard Allphin — J. K. Kilpatrick
R. D. Bradley — C. N. Laupp
L. H. Brown — H. L. Logan
H. F. Davidson — J. D. MacConnell
A. A. Eastman — B. M. McLean
W. S Fisher — J. J. Neidhart
W. V. C. Foulks — J. F. Parsons
J. W. Griffith — R. C. Putnam
J. P. Hamill — F. K. Sampson
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Chester Jarrett — H. A. Stroud
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(*Continued on page 55A*)

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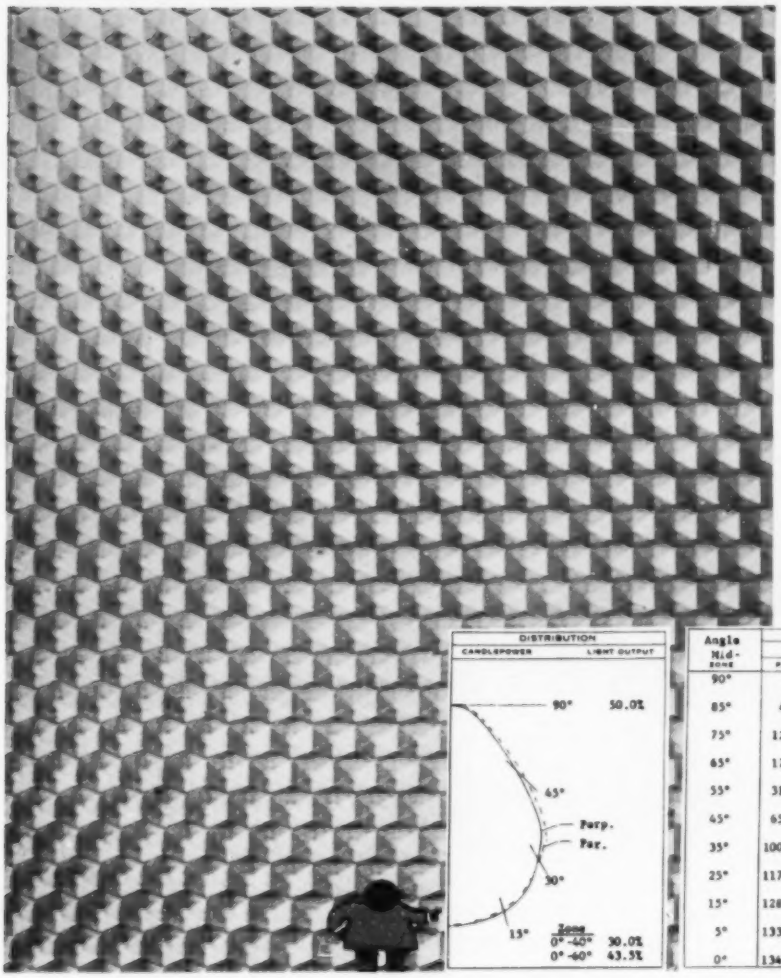
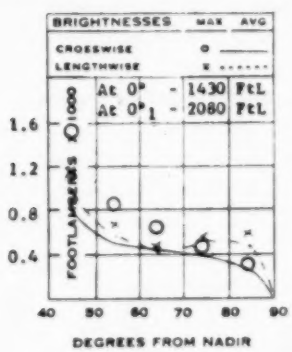


Angle Mid-Zone	Mid-Zone Candlepower Horizontal Angles					Lumens
	Par	22½	45	67½	Perp	
90°	0		0		0	-
85°	40.2		40.2		25.3	40
75°	127		125		96.9	125
65°	176		200		179	188
55°	317		313		279	276
45°	653		620		554	472
35°	1003		1000		970	625
25°	1177		1198		1196	551
15°	1281		1293		1301	365
5°	1334		1335		1338	127
0°	1341		1341		1341	-



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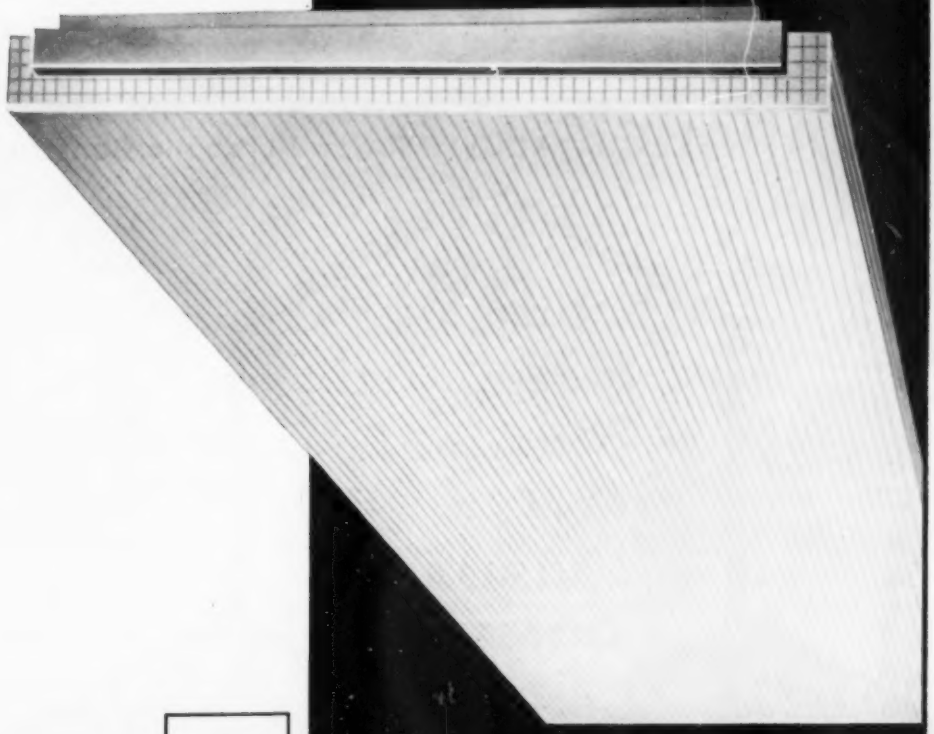

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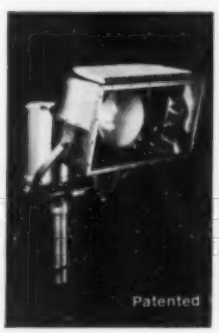

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_____ with Wide-Lites.

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Company_____

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the new idea line

featuring U-all*

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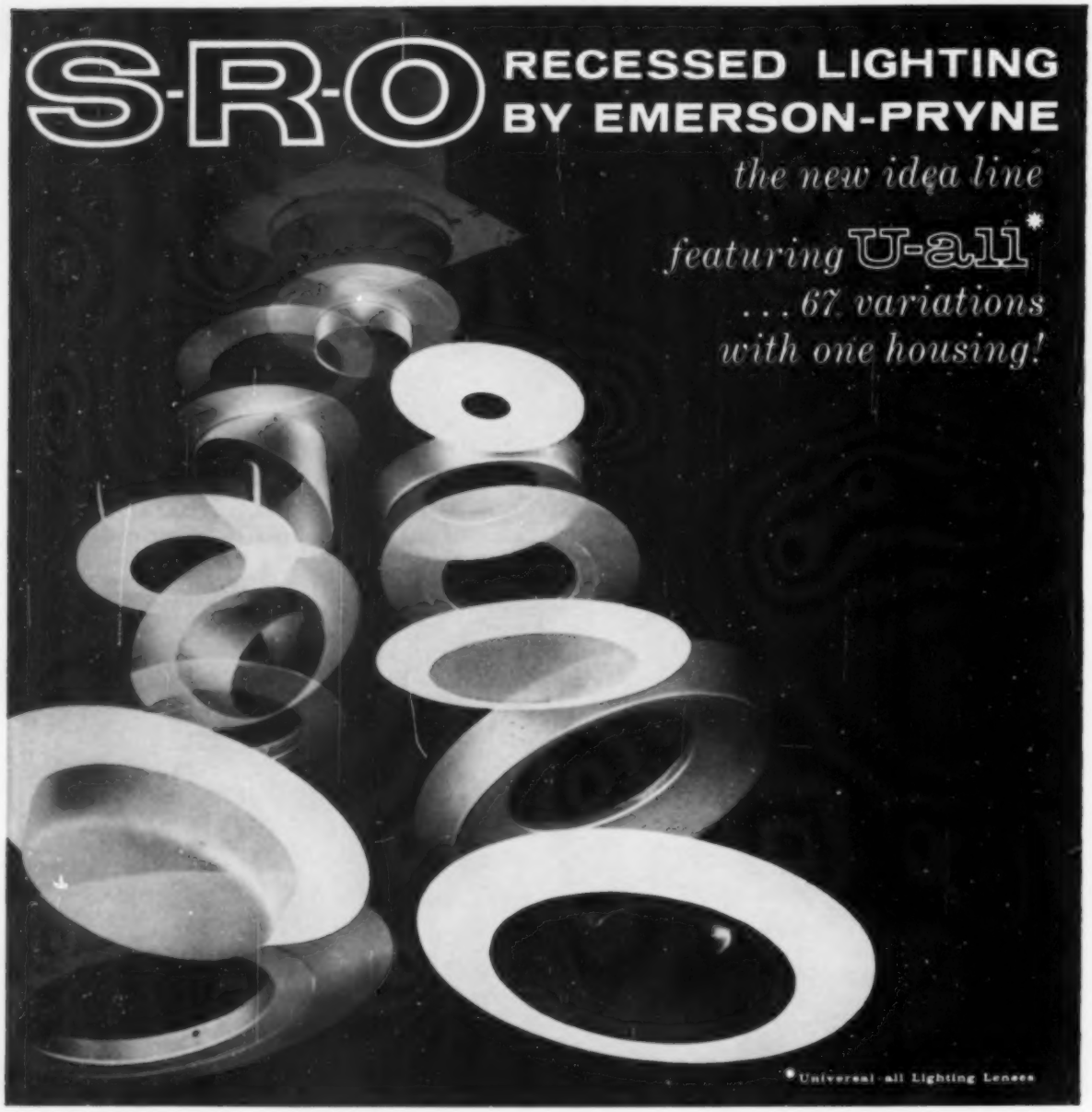

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(Continued from page 46A)

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Copper-free aluminum castings, various types of steel porcelain enamel reflectors accommodating 150 watt and 200 watt lamp sizes. Available in pendent, ceiling, bracket and concrete mounting types, with openings for ½", ¾" and 1" conduit.

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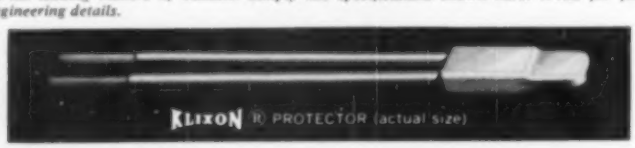

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(*Continued from page* 40A)

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(*Continued on page* 58A)

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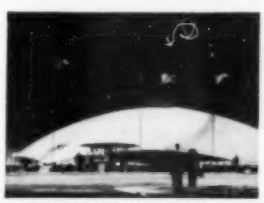
SOLITROL lighting control opens at Circle Arts Theatre



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(*Continued from page 57A*)

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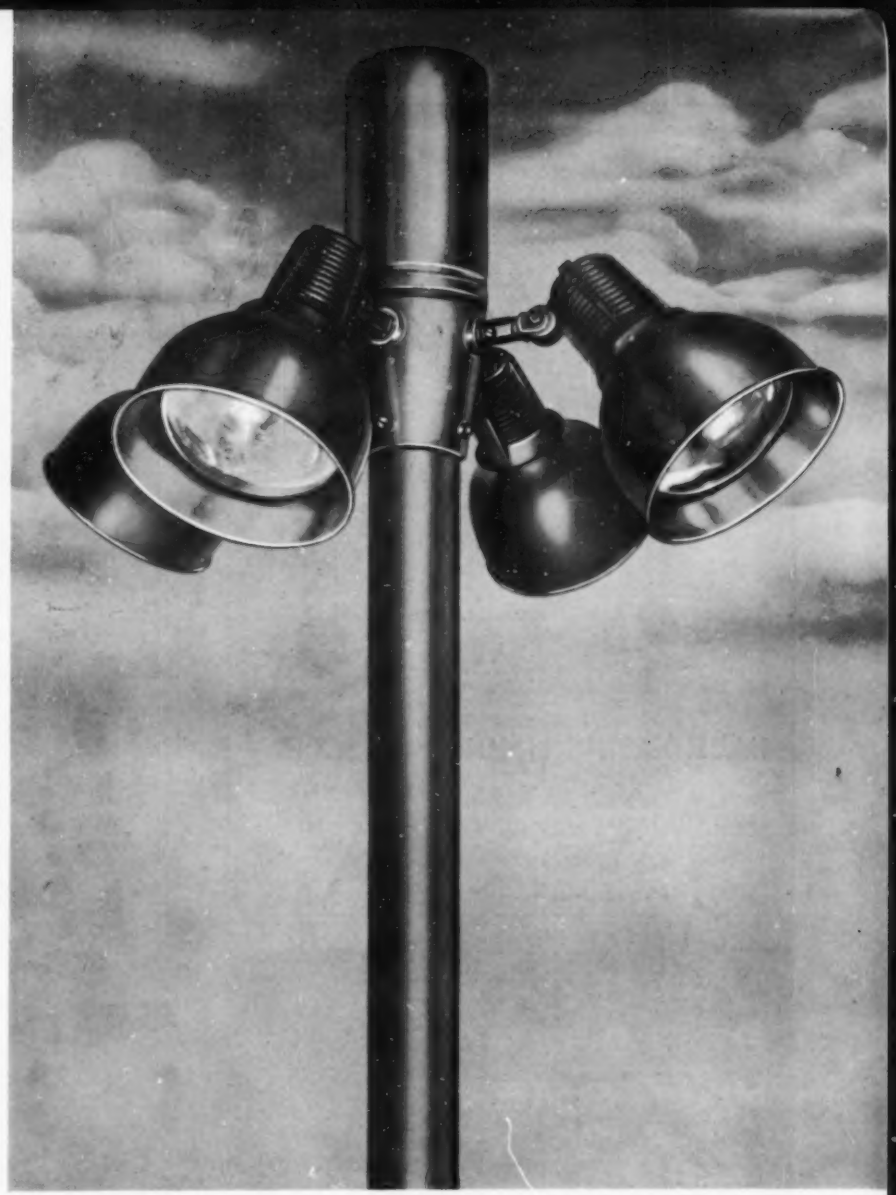

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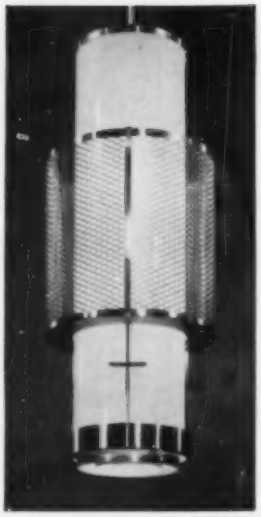

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Containing seven electrical ranges plus seven neutral attenuation ranges, the SPECTRA Pritchard Photometer reads a wider range of brightness than any other instrument in the field of photometry. Polarized light is as accurately measured as unpolarized light since there are no reflecting surfaces in the measuring beam. In addition, a wide choice of view angles is available through the use of five interchangeable mirror apertures. This meter has become a major tool for research scientists in visual psychology and illumination engineering.

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Length 14" Weight 9 lbs.

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Now EVERYBODY Specifies it to KEEP Louvers CLEAN

NEW #79 CONCENTRATE **MERIX Anti-Static**

PREVENTS STATIC ON PLASTIC SHEETS OR MOLDED PRODUCTS

ONE APPLICATION REMOVES STATIC CHARGES FOR MONTHS. EACH GAL. CONCENTRATE #79 MAKES **TWO** GALLONS DESTATICIDER

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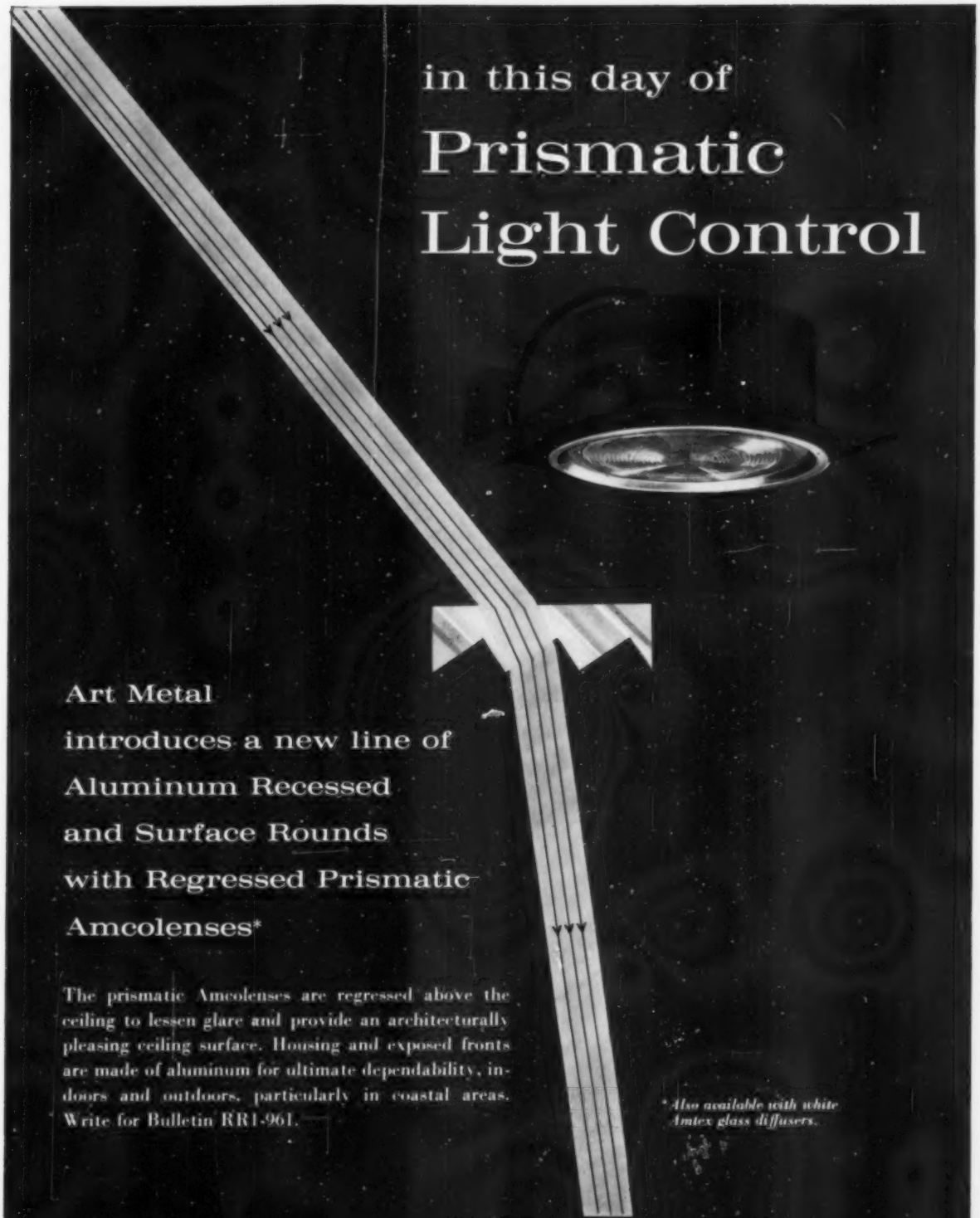
Prismatic Light Control



Art Metal introduces a new line of Aluminum Recessed and Surface Rounds with Regressed Prismatic Amcolenses*

The prismatic Amcolenses are regressed above the ceiling to lessen glare and provide an architecturally pleasing ceiling surface. Housing and exposed fronts are made of aluminum for ultimate dependability, indoors and outdoors, particularly in coastal areas. Write for Bulletin RR1-961.

*Also available with white Amtex glass diffusers.

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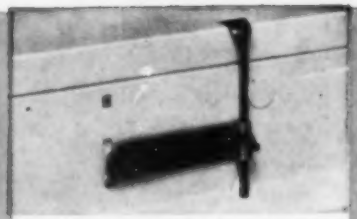
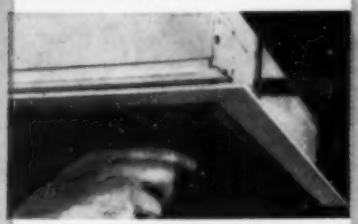
GUTH saves up to 53% on Troffer installation*



Swing Mounting Bracket is preset for height of ceiling support members by adjusting single screw.



Release SMB by tripping clip from inside troffer. It's ready to hook over support.

Adjust screw to draw up troffer trim flush with ceiling. The job is done!

NEW SHALLOW MODELS WITH CBM/ETL BALLASTS, SEPARATELY FUSED

with NEW SMB swing mounting brackets

New Guth Troffers feature Swing Mounting Brackets to simplify installation...**plus** a complete variety to fit most every specification requirement!

New 4¾" shallow models come in 2' and 4' widths. Other units in 6" and 12" widths . . . 2', 4' and 8' lengths. Almost any bottom you can name — including GrateLite Louver Diffuser** and Prismoid GrateLite†. Adaptable to nearly every type of ceiling suspension system.

*These savings do not include wiring and final connections and are based on installation in a plaster or concealed suspension system.

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